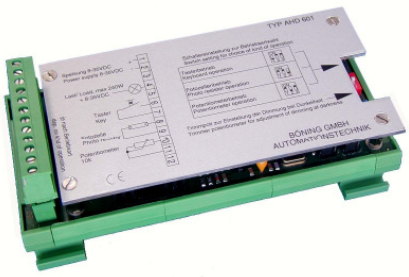
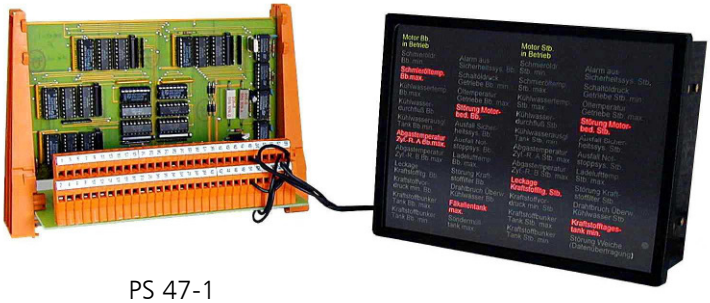
DEVELOPMENT MANUFACTURING SERVICE
FOR SHIPPING AND INDUSTRY



10A Impulse length dimmer
AHD 601 for 24VDC,
operation with photo resistor,
potentiometer or pushbutton

Alarm systems centralized and decentralized
Binary and analog data stations
Data distributors
LCD-monitors
Dimmers
Earth fault monitoring systems
Bow thruster controls
Position- and signal lantern controls
Safety-systems for ship main engines
Start-Stop Diesel control systems
St.-by-pump- and compressor controls
Thermo-element amplifier
Tank level and content measurement
Devices for customer requirements

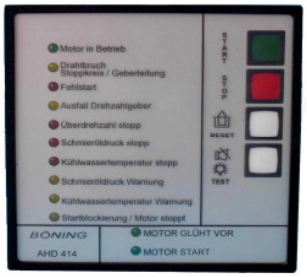
Alarm- and safety-system
AHD 414A



PS 47-1

KOMPAKT EDA 47

Alarm- and display system KOMPAKT EDA 47
with illuminated and automatically dimmed
text fields and binary data station PS 47-1
for 47 inputs



Diesel-
start-stop-
automatic
AHD 414

AHD 406,
control device
with 10
illuminated
and
automatically
dimmed text
fields

Decentralized position- and
signal lantern control and
monitoring unit DPS 01 for up
to 32 monitored lamp circuits

LCD-monitor AHD 524 with
automatically dimmed background
illumination

AHD 408E, St.-
by-pump-
control for two
independently
working pairs of
pumps

BÖNING
Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee ©10.03.2009, SoT-1605
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

TABLE OF CONTENTS

This catalog gives a general overview of our product range. For some of the devices, more detailed information is available on request.

1. Alarm and Display Systems

Alarm System KOMPAKT EDA 47 for 47 Alarms 1
Group Alarm System for 10 Groups AHD 406H 2
Monitoring and Control Device for 10 Alarms AHD 406 3
Alarm System for 10 Alarms AHD 414A 4
Alarm System AHD 530 with Serial Input 5
Decentralized Data Collection with AHD 903-15 and Display on LCD-Monitor AHD 524 6
Chamber and Mess Room Panel AHD 406-2 7

2. Diesel Engine Controls and Safety Systems

Start-Stop Diesel Monitoring Automatic AHD 414 8
Emergency Power Automatic AHD 414 with Mains + Generator Power Supervision AHD 414NG 9
Alarm and Safety System for 10 Alarms AHD 414A 4

3. St.-by Pump and Compressor Controls AHD 408 Series

St.-by Pump Control for two Pairs of Pumps AHD 408E 10
St.-by Pump Control for two Electrical St.-By Pumps (Attached Main Pump) AHD 408A 10
St.-by Pump and Compressor Control AHD 408E-K 10

4. Data Stations, Data Distributors and Amplifiers for Thermocouples

Binary Data Station PS 47-1-15 for 15 Inputs 11
Binary Data Station PS 47-1 for 47 Inputs 12
Analog Data Station AHD 903-15 with Relay Unit AHD 903R 13
Data Distributor AHD W (Version A) 14
Data Distributor AHD W (Version B) 15
Amplifier for 14 Thermocouples NiCrNi AHD 903 V 16
Relay Station with 15 Relays and Serial Energizing Type AHD R101 17

5. Dimmer

Impulse Length Dimmer AHD 601, 24V/10A, for Rail Mounting 18

6. Isolation Control

Isolation Control Device AHD 519 19

7. Position- and Signal Lantern Control

Modular Position- and Signal Latnern Control DPS 01 for 8 to 32 Lanterns 20

8. Bow Thruster Controls

Decentralized Bow Thruster Control for Slip Ring Rotor Engines 21
Control for Bow Thrusters with Variable Pitch Propellers 22

9. Example of Use

Exhaust Gas Average Value Control for Diesel Engines 23

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Am Steenöver 4 • D-27777 Ganderkesee • Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-21 /-22
internet: www.boening.com • mail: info@boening.com

Description starts on highway A1

- Exit „Groß Mackenstedt“ towards Oldenburg (final destination is marked with red arrows, see drawing upper right corner of the map)
- Keep going on A 1 until exit „Delmenhorst Ost, Groß Mackenstedt“
- Follow feeder road B 322 towards „Delmenhorst/ Oldenburg“ for 4,3 km
- Stay in left lane at inter-connection A 28, after 7,6 km take exit „Ganderkesee Ost“
- Go right towards „Schierbrok/ Hoykenkamp“ („Almsloher Str.“)
- After 2,2 km turn right at next traffic circle (direction „Delmenhorst/ Hoykenkamp“)
- After 200 m go left onto the first road („Auf dem Hohenborn“)
- Proceed straight through the village of „Elmeloh“, after 2 km turn left at the end of the road towards „Bookholzberg“ („Schierbroker Landstraße“)
- After 500 m turn left onto „Am Buschhagen“
- At road’s end turn left onto „Am Steenöver“ before arriving at the third building on the lefthand side.

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Am Steenöver 4 • D-27777 Ganderkesee • Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-21 /-22
internet: www.boening.com • mail: info@boening.com

ALARM AND DISPLAY SYSTEM KOMPAKT EDA 47

- Device for control desk mounting, front dimensions 192mm x 144mm.
- 48 illuminated and automatically dimmed text fields (40mm x 10mm), of which 47 can be used arbitrarily.
- Low costs for labeling, due to only one film-negative for all measuring points; only the text is illuminated; empty fields (see measuring points 2 and 4) are opaque.
- Every report can be programmed as alarm or display.
- 5 inputs for suppression of arbitrary reports.
- Delays for switching on and off between 1 and 99 sec.
- Every text field is illuminated by display elements into which 16 LEDs are integrated.
- Low wiring effort due to serial data entry.
- Connection with ribbon cable and terminal block (part of delivery)
- Integrated horn.
- One relay output each for horn and collective report.
- GL classification

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

Content

KOMPAKT EDA 47		Page
1.	General	2
2.	Construction	2
3.	Function	2
3.1	Data collection	2
3.2	Alarms/Messages	3
3.3	Reset/lamp test	3
3.4	Test	3
3.5	Alarm blocking	3
3.6	Switch-on/switch-off delays	3
3.7	NO or NC contact	3
3.8	Grouping	3
3.9	Dimming of the text field	4
3.10	Data collection via 2 serial inputs	4
4.	Measuring point list and programming	4
	Measuring point list	5
	Installation dimensions and terminal diagram	6
	Technical data	6
	Programming table	7
	Example: Kompakt EDA 47 with binary data station PS 47-1	8

1. General

Kompakt EDA 47 is a microprocessor controlled device for control desk mounting which is mainly used as alarm system on ships. Data is received serially from binary or analog data stations or from a data distributor AHD W. The bridge is the suitable installation site on board for this device because of the illuminated and automatically dimmed text fields. Serial data collection minimizes the required wiring between ECR and bridge. This feature is especially important for ships with lift-up bridges where wiring is not only expensive but also easily damaged.

Every text field has dimensions of 40 x 10 mm which enables the texts to be easily read. The whole text field is designed as a film-negative for 48 measuring points. The text is illuminated from below when the corresponding measuring point is activated. This text-film can be removed and exchanged effortlessly. The costs for a new text-film are low, so that the system and texts can be easily redesigned, if necessary.

2. Assembly

Kompakt EDA 47 consists of 2 electronic cards above each other. The upper card is almost completely covered with surface LED elements. Every monitored measuring point consists of two such elements (16 individual LEDs each). The components are plugged onto IC sockets and can easily be exchanged. They are available in red, green or yellow.

The text field lies directly on the flat LED components (film negative). It is protected by a glass front cover fixed in a frame.

The second electronic card is located on the rear of the case. It contains the processor system and all peripheral components. The cards are interconnected by a 60-pole ribbon cable. The EEprom (28C64) is located on the rear of the card and can be removed for modifications to the system‘s function. It contains the system software, as well as an area for user-specific data.

All inputs and outputs are transmitted to a transfer unit (terminal block) by means of a 20-pole ribbon cable.

3. Function

3.1 Data collection

Kompakt EDA 47 can be addressed serially by the following devices:

- binary data station PS 47-1-(08; 12; 15) for 8, 12 or 15 binary inputs.
- binary data station PS 47-1 for 47 binary inputs.
- analog data station AHD 903-15
- data distributor AHD W

The easiest application is data capturing by a PS-47-1. Here inputs 1 to 47 correspond to the terminal numbers of the data station and the measuring point numbers in the Kompakt EDA 47 device (see page 9 of this description).

Other data stations are normally used in combination with a data distributor AHD W for larger decentralized systems. In this case, the assignment of the inputs on the substations can be programmed arbitrarily for up to 8 Kompakt EDA 47 systems (376 measuring points).

3.2 Alarms/Messages

Every measuring point can be programmed to release either an alarm or a message. The measuring point flashes in the event of an alarm. Furthermore the horn, the integrated buzzer and the collective alarm relays are activated. In the event of an alarm being activated while a previous one has not yet been reset, the latest alarm will flash with half the normal frequency. This is an important feature since the second alarm is often a consequence of the previous one. The routine enables recognition of the alarm sequence.

Where the measuring point is programmed as a message it is represented by a steady light and no relay is switched.

3.3 Reset/Lamp test

Alarms must first be acknowledged acoustically, then optically. The internal buzzer and the horn relay are switched off by acoustic acknowledgement. The optical acknowledgement causes the flashing text field to show steady light instead. This sequence is mandatory, as during switched-on horn the optical reset function is blocked.

The whole text field is illuminated by pushing the lamp test button.

3.4 Test

Kompakt EDA 47 has an input with the assigned function TEST. When this input is activated, all text fields are illuminated.

3.5 Alarm blocking

Each measuring point can be blocked or activated by the first 5 measuring points. It is therefore useful to assign operational functions to them (i.e. main motor is running, auxilliary diesel no.1 is running,...) as they usually determine if a measuring point is blocked or activated. Multiple blocking of a measuring point is possible.

3.6 Switch-on/switch-off delays

Time delays between 1 and 90 seconds can be programmed independently for both alarms and messages.

3.7 NO/NC inputs

Every measuring point can be programmed to handle NO or NC contact. If analog data stations (e.g. AHD 903-15) are used, all inputs are programmed as NO contacts, irrespective of whether the message is to be shown at rising or falling signal or both.

3.8 Grouping

Kompakt EDA 47 has a serial output (terminal 3) by which the processed data is led. It is connected to a group panel AHD 406H where, among others, 10 arbitrarily programmable groups can be formed. Up to 3 KOMPAKT EDA 47 can be connected to a group panel AHD 406H. Grouping with a higher resolution is furthermore possible by using one KOMPAKT EDA 47 device as group panel as well. Special software is available for this purpose. Up to 3 KOMPAKT EDA 47 devices can be connected to a group panel with the same designation (48 groups consisting of 144 individual messages).

3.9 Dimming of the text field

The front panel of the device contains a photo resistor of about 5 mm diameter. It registers the ambient brightness. The evaluation electronics is part of the bottom card. There is a trim pot at the rear of the device by which the brightness of the text field can be adjusted. There is no dimming in daylight conditions.

3.10 Data collection via 2 serial inputs

Sometimes it is more economic to register the inputs e.g. by two data stations PS 47-1 in order to minimize wiring, because the sensors may be located far away from each other. In this case, data station 1 is connected to serial input 1 and data station 2 is connected to serial input 2. Inputs of the same channel number from both data stations are thus OR-concatenated, as long as this is provided in the programmed configuration (see last page of this description). Further input blockings can thereby be realized insofar as the connected switches are normally closed. Where they are normally open, they can activate measuring points from either of the data stations.

4. Measuring point lists and programming

Measuring point lists are the basis for the design and programming of alarm systems and are completed by the customer.

The devices are programmed according to the customer's requirements. Modifications to the program are sometimes necessary on site during commissioning, which can also be carried out by the customer.

Our documentation includes a programming table for adaptation of the KOMPAKT EDA 47 to existing systems. This is facilitated by a standard programming device with PC-connection, e.g. the battery operated S4 device.

An EEprom type 28C64 is plugged into an IC-socket at the rear of the KOMPAKT EDA 47 housing. The EEprom is removed, plugged into the programming device and its program copied . After modification (editing of storage addresses), the EEprom is reprogrammed and reinserted into the KOMPAKT EDA 47. Programming with the S4 device takes about 2 seconds.

Measuring point list for Compact EDA 47 (Page .... out of .... pages)

Client :

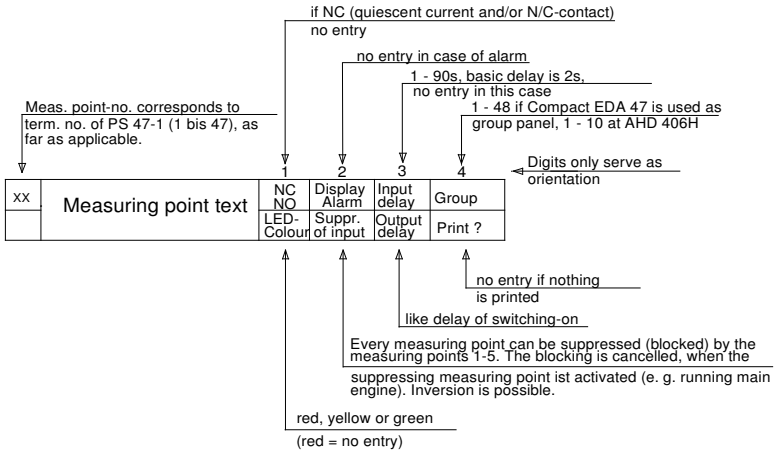
Shipyard :

Newbuilding :

Name of ship :

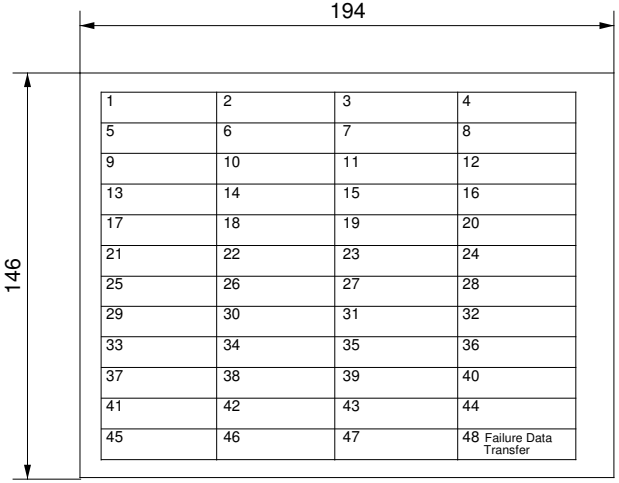
Com.-no. :

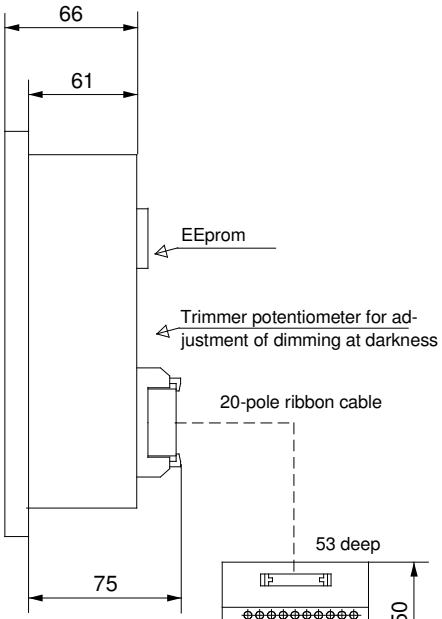
Date :

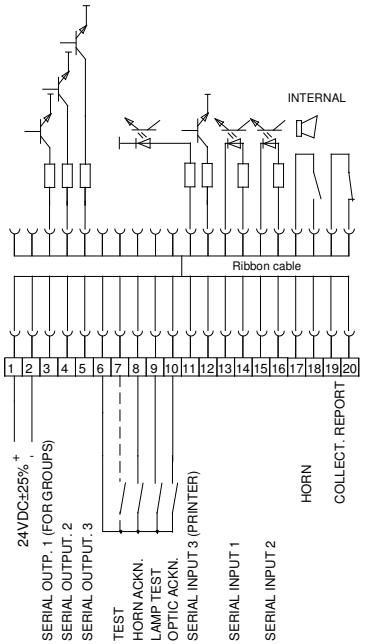


	1 2 3 4		1 2 3 4		1 2 3 4		1 2 3 4
01		02		03		04	
05		06		07		08	
09		10		11		12	
13		14		15		16	
17		18		19		20	
21		22		23		24	
25		26		27		28	
29		30		31		32	
33		34		35		36	
37		38		39		40	
41		42		43		44	
45		46		47		48	Failure data transfer

Installation measurements and connection plan







Technical data

Power supply	: 24VDC +/-25%
Current consumption of electronic	: app. 0,2A (all text fields altog. app. 1.2A)
Inputs	: 3 x serial (TTY), 4 x binary
Outputs	: 2 relays, 4 x serial
Chargeability of relay outputs	: 50V / 1A
Degree of protection at front	: IP23, (with front-cap IP54)
Installation depth	: 75mm
Panel cutaway	: 185mm x 137mm
Weight	: app. 1kg

PROGRAMMING TABLE FOR DECENTRALISED ALARM SYSTEM **KOMPAKT EDA 47**

Client : ..... Order-no. of client :..... Device-no.: .....

Komp1-e

Newbuilding : .....

Input	Alarm (00) Display (01)	NC (00)[a] NO (01)	Switching-on[b] delay	Switching -off delay[b]	Suppression by input[c]				
					1	2	3	4	5
1	1E30	1E00	1E60	1860	1E90	1EC0	1EF0	1F20	1F50
2	1E31	1E01	1E61	1861	1E91	1EC1	1EF1	1F21	1F51
3	1E32	1E02	1E62	1862	1E92	1EC2	1EF2	1F22	1F52
4	1E33	1E03	1E63	1863	1E93	1EC3	1EF3	1F23	1F53
5	1E34	1E04	1E64	1864	1E94	1EC4	1EF4	1F24	1F54
6	1E35	1E05	1E65	1865	1E95	1EC5	1EF5	1F25	1F55
7	1E36	1E06	1E66	1866	1E96	1EC6	1EF6	1F26	1F56
8	1E37	1E07	1E67	1867	1E97	1EC7	1EF7	1F27	1F57
9	1E38	1E08	1E68	1868	1E98	1EC8	1EF8	1F28	1F58
10	1E39	1E09	1E69	1869	1E99	1EC9	1EF9	1F29	1F59
11	1E3A	1E0A	1E6A	186A	1E9A	1ECA	1EFA	1F2A	1F5A
12	1E3B	1E0B	1E6B	186B	1E9B	1ECB	1EFB	1F2B	1F5B
13	1E3C	1E0C	1E6C	186C	1E9C	1ECC	1EFC	1F2C	1F5C
14	1E3D	1E0D	1E6D	186D	1E9D	1ECD	1EFD	1F2D	1F5D
15	1E3E	1E0E	1E6E	186E	1E9E	1ECE	1EFE	1F2E	1F5E
16	1E3F	1E0F	1E6F	186F	1E9F	1ECF	1EFF	1F2F	1F5F
17	1E40	1E10	1E70	1870	1EA0	1ED0	1F00	1F30	1F60
18	1E41	1E11	1E71	1871	1EA1	1ED1	1F01	1F31	1F61
19	1E42	1E12	1E72	1872	1EA2	1ED2	1F02	1F32	1F62
20	1E43	1E13	1E73	1873	1EA3	1ED3	1F03	1F33	1F63
21	1E44	1E14	1E74	1874	1EA4	1ED4	1F04	1F34	1F64
22	1E45	1E15	1E75	1875	1EA5	1ED5	1F05	1F35	1F65
23	1E46	1E16	1E76	1876	1EA6	1ED6	1F06	1F36	1F66
24	1E47	1E17	1E77	1877	1EA7	1ED7	1F07	1F37	1F67
25	1E48	1E18	1E78	1878	1EA8	1ED8	1F08	1F38	1F68
26	1E49	1E19	1E79	1879	1EA9	1ED9	1F09	1F39	1F69
27	1E4A	1E1A	1E7A	187A	1EAA	1EDA	1F0A	1F3A	1F6A
28	1E4B	1E1B	1E7B	187B	1EAB	1EDB	1F0B	1F3B	1F6B
29	1E4C	1E1C	1E7C	187C	1EAC	1EDC	1F0C	1F3C	1F6C
30	1E4D	1E1D	1E7D	187D	1EAD	1EDD	1F0D	1F3D	1F6D
31	1E4E	1E1E	1E7E	187E	1EAE	1EDE	1F0E	1F3E	1F6E
32	1E4F	1E1F	1E7F	187F	1EAF	1EDF	1F0F	1F3F	1F6F
33	1E50	1E20	1E80	1880	1EB0	1EE0	1F10	1F40	1F70
34	1E51	1E21	1E81	1881	1EB1	1EE1	1F11	1F41	1F71
35	1E52	1E22	1E82	1882	1EB2	1EE2	1F12	1F42	1F72
36	1E53	1E23	1E83	1883	1EB3	1EE3	1F13	1F43	1F73
37	1E54	1E24	1E84	1884	1EB4	1EE4	1F14	1F44	1F74
38	1E55	1E25	1E85	1885	1EB5	1EE5	1F15	1F45	1F75
39	1E56	1E26	1E86	1886	1EB6	1EE6	1F16	1F46	1F76
40	1E57	1E27	1E87	1887	1EB7	1EE7	1F17	1F47	1F77
41	1E58	1E28	1E88	1888	1EB8	1EE8	1F18	1F48	1F78
42	1E59	1E29	1E89	1889	1EB9	1EE9	1F19	1F49	1F79
43	1E5A	1E2A	1E8A	188A	1EBA	1EEA	1F1A	1F4A	1F7A
44	1E5B	1E2B	1E8B	188B	1EBB	1EEB	1F1B	1F4B	1F7B
45	1E5C	1E2C	1E8C	188C	1EBC	1EEC	1F1C	1F4C	1F7C
46	1E5D	1E2D	1E8D	188D	1EBD	1EED	1F1D	1F4D	1F7D
47	1E5E	1E2E	1E8E	188E	1EBE	1EEE	1F1E	1F4E	1F7E
"48"	1E5F	1E2F	1E8F	188F	1EBF	1EEF	1F1F	1F4F	1F7F

komp1

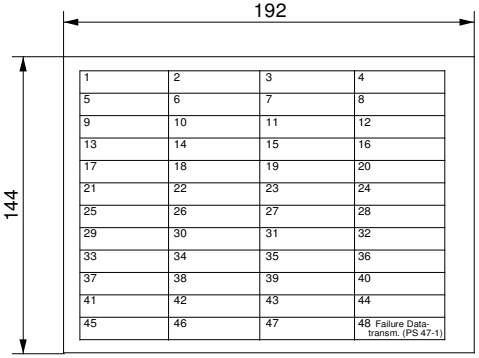
- The storage addresses are indicated on the left side of each column. The data is entered Into the empty fields on the right side corresponding to the individual requirements. **All empty fields have the content "00".**
- The input marked "48" is activated, when the data conduit between transmitter and Compact EDA is interrupted.

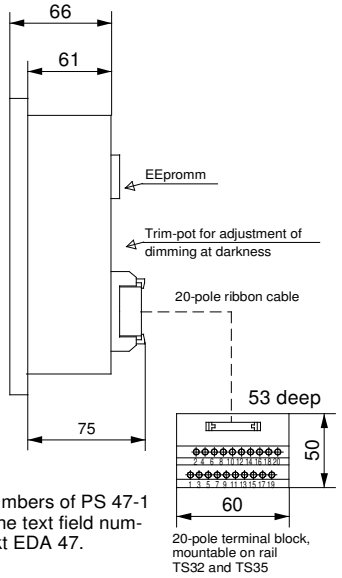
a) NC: Report is executed at open contact or falling analog measuring point; the content of the storage address has to be "00".
NO: Report is executed at closed contact or rising analog measuring point; the content of the storage address has to be "01".

b) Content of the storage address corresponds appr. to the delay time in seconds. If a Compact EDA 47 device is directly connected to the data station PS 47-1, the content (if > 10s) has to be increased by 10%, which means that the content of the storage cell for a delay of 20s is 22s. Entering is executed decimally. The maximum content is 99.

c) Every input can be suppressed by the inputs 1 to 5. Example: measuring point 1→auxiliary diesel engine 1 in operation; measuring point 8→ auxiliary diesel engine 1 oil pressure leakage; measuring point 8 shall be suppressed by measuring point 1, when engine is not running. Content of the storage address 1E97 has to be "01". The suppression is cancelled when the report „auxiliary diesel engine in operation“ is released and the corresponding delay time has elapsed. The assignment of the suppressed measuring points to the „suppressing inputs“ is executed by entering „01“ into the relevant storage addresses. This means if measuring point 27 is to be suppressed by input 5, the content „01“ is also entered into the storage address 1F6A (not "05"). Multiple suppressing of one measuring point is permitted.

Kompakt EDA 47



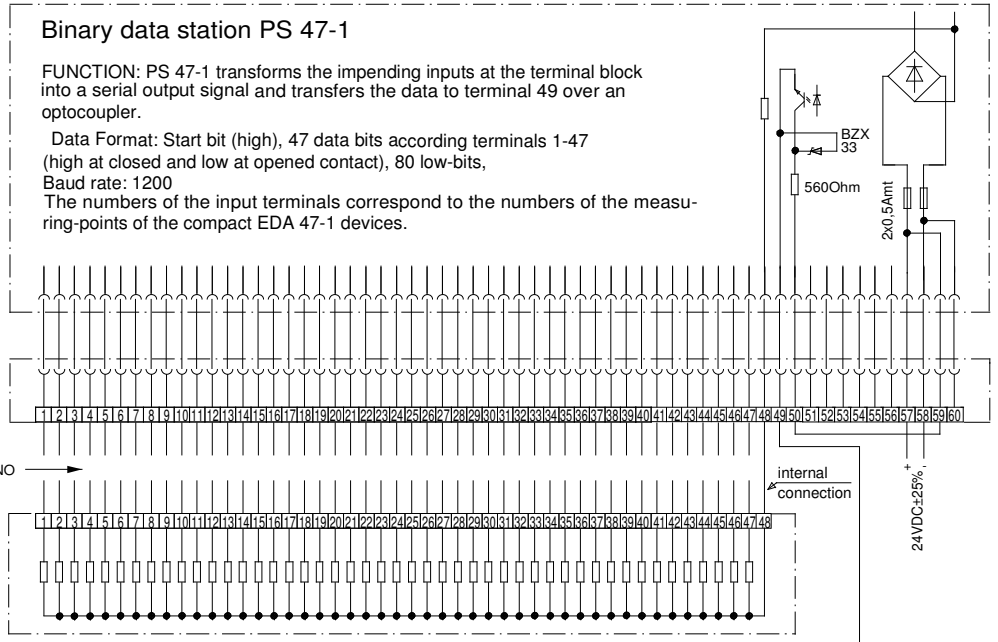


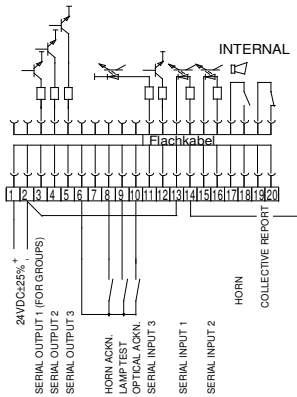
The terminal numbers of PS 47-1 correspond to the text field numbers of Kompakt EDA 47.

Binary data station PS 47-1

FUNCTION: PS 47-1 transforms the impending inputs at the terminal block into a serial output signal and transfers the data to terminal 49 over an optocoupler.

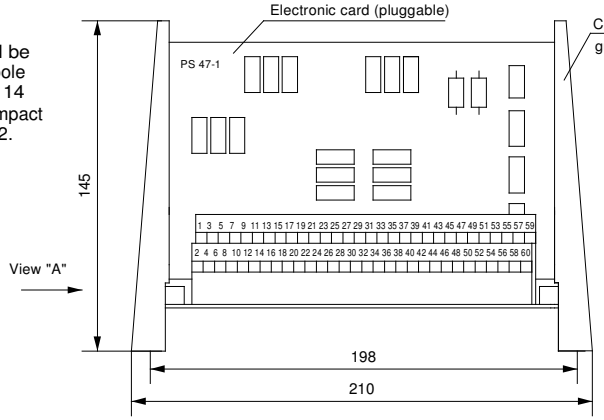
Data Format: Start bit (high), 47 data bits according terminals 1-47 (high at closed and low at opened contact), 80 low-bits,
Baud rate: 1200
The numbers of the input terminals correspond to the numbers of the measuring-points of the compact EDA 47-1 devices.

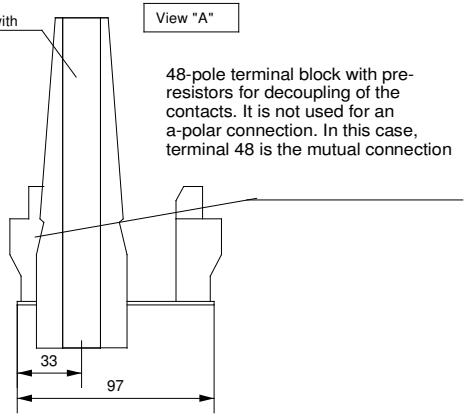




serial data wire

If more than one Compact EDA 47 device shall be connected to a serial wire, terminal 13 of the 20-pole terminal block will be connected with terminal 14 of the next station. Only terminal 13 of the last compact EDA 47 receives the serial connection to terminal 2.





48-pole terminal block with pre-resistors for decoupling of the contacts. It is not used for an a-polar connection. In this case, terminal 48 is the mutual connection

Technical Data

Power supply	: 24VDC +/-25%
Consumption of the electronics	: appr. 0.2A (all textfields together appr. 1.2A)
Inputs	: 3 x serial (TTY), 4 x binary
Outputs	: 2 relays, 4 x serial
stress capacity of the relay outputs	: 50V/1A
Degree of protection on front-side	: IP23, (with front cap IP54)
Installation depth	: 75mm
Panel cut-out	: 185mm x 137mm
Weight	: appr. 1kg

Technical Data

Power supply	: 24VDC +/-25%
Consumption of the electronics	: appr. 0.3A
Inputs	: 47 x binary over optocoupler
Outputs	: 1 x serial
Degree of protection	: IP00
Weight	: appr. 1kg

	R3E.mcd	Decentralized Alarm System Kompakt EDA 47 with Binary Data Station PS 47-1

ALARM GROUP PANEL AHD 406H

406Hkat-englisch.doc

- Microprocessor-controlled device for control desk installation
- Registers 144 individual reports from i.a. up to three KOMPAKT EDA-47-systems, via three serial inputs
- Forms 10 arbitrarily programmable groups; every individual report can activate up to two groups
- Internal printer control
- Prints 144 texts with 32 characters each with AHD 12 printer
- Two serial outputs for addressing of cabin and mess room panels
- Each group can be programmed to trigger either an alarm or a status message
- Six additional sub group relays can be allocated to one or more of the ten groups. Its contacts (floating transfer contacts) are available at the 50-pole terminal block.
- One horn and one collective alarm relay are available
- Connected by ribbon cable and 50-pole terminal block
- Integrated engineer calling system
- Available with individual LED or illuminated, automatically dimmed text-field for dark environments
- GL classification

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

CONTENTS

		PAGE
1.	General	3
2.	Construction	3
3.0	Function	3
3.1	Data registration	3
3.2	Grouping	3
3.3	Alarms/messages	3
3.4	Acoustic acknowledgement	4
3.5.	Optical acknowledgement	4
3.6	Multiple addressing of a group	5
3.7	Lamp test	5
3.8	Collective alarm relays and subgroup relays	5
3.9	Engineer call	5
3.10	System failure	5
3.11	Dimming of the display elements	5
Technical data		6
Terminal diagram		6
Dimensional drawing		6
Order-related technical specification		7
System-specific programming		8

1. General

AHD 406H is a group alarm and display unit for 10 groups mainly used on vessels (bridge). It has three serial inputs by which it can register 48 individual reports per channel, a total of 144 reports altogether. Each report can address between zero and two groups. Every group can be programmed to release either an alarm or a status message. Six subgroup relays with floating transfer contacts are available for control purposes. Each of these relays can be assigned (arbitrarily programmable) to the ten groups, insofar as these are designated as alarms. The unit has two serial outputs to address the engineer and messroom control panels. It has a further serial output to control a printer.

2. Assembly

AHD 406H consists of two electronic cards connected by stay-rods. They form a plug-in unit together with the front panel. This plug-in unit is located in a housing for switchboard mounting according to DIN 43700. Its front dimensions are 72mm x 144mm and the installation depth is 227mm. The delivery includes a 50-pole terminal block that can be mounted on a TS32 or TS35 mounting rail and a ribbon cable as plug-in connection between device and terminal block.

The front panel is available in two versions (see illustration on page 1 of this description):

- with individual LEDs and slide-in text field for illuminated rooms
- with surface LEDs and text field as film negative, e. g. for bridges on vessels

3.0 Functions

3.1 Data registration

AHD 406H registers the data via three serial inputs (optocoupler, floating input). The following devices are possible i.a.:

- alarm and monitoring system KOMPAKT EDA 47
- data distributor AHD W
- alarm and safety system AHD 414A

The device receives the data according to the following serial data protocol:

Start-bit (high), 48 data bits of which the high-bits can be grouped, 8 control bits for serial acknowledgement, 80 to 500 stop-bits (low). There are no start or stop bits during transmission. The data rate is 1200 baud.

It would be beyond the scope of this manual to go into further detail concerning the reasons for this unusual serial format. It is however possible to adapt the software if necessary.

3.2 Grouping

The device stores its operating system and system-specific data on an Eprom 27C64 or EEprom 28C64. If a print function necessitating additional storage space for the texts is required, an EPROM 27C256 is used.

Address fields for grouping, further definition of the groups and sub-group relays can be found on page 8 of this description (system-specific programming). The plug-in unit can be removed from the housing, following loosening of the housing-frame and the fixing screw to access the EPROM or EEPROM. The storage is located on the upper card and can be removed from the IC-socket for programming.

3.3 Alarms/Messages

Each group can be programmed to release an alarm or a status message. An alarm causes flashing of the corresponding measuring point. Simultaneously, the horn and collective alarm relay are activated and where programmed one of the six sub-group relays. A measuring point which is programmed to release a message is constantly illuminated. Relays are not influenced by status messages.

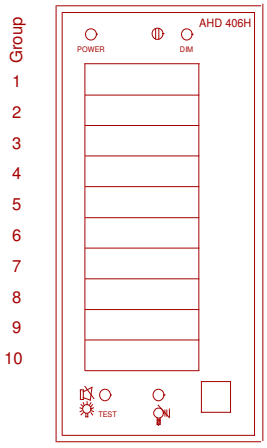
Example for serial data registration

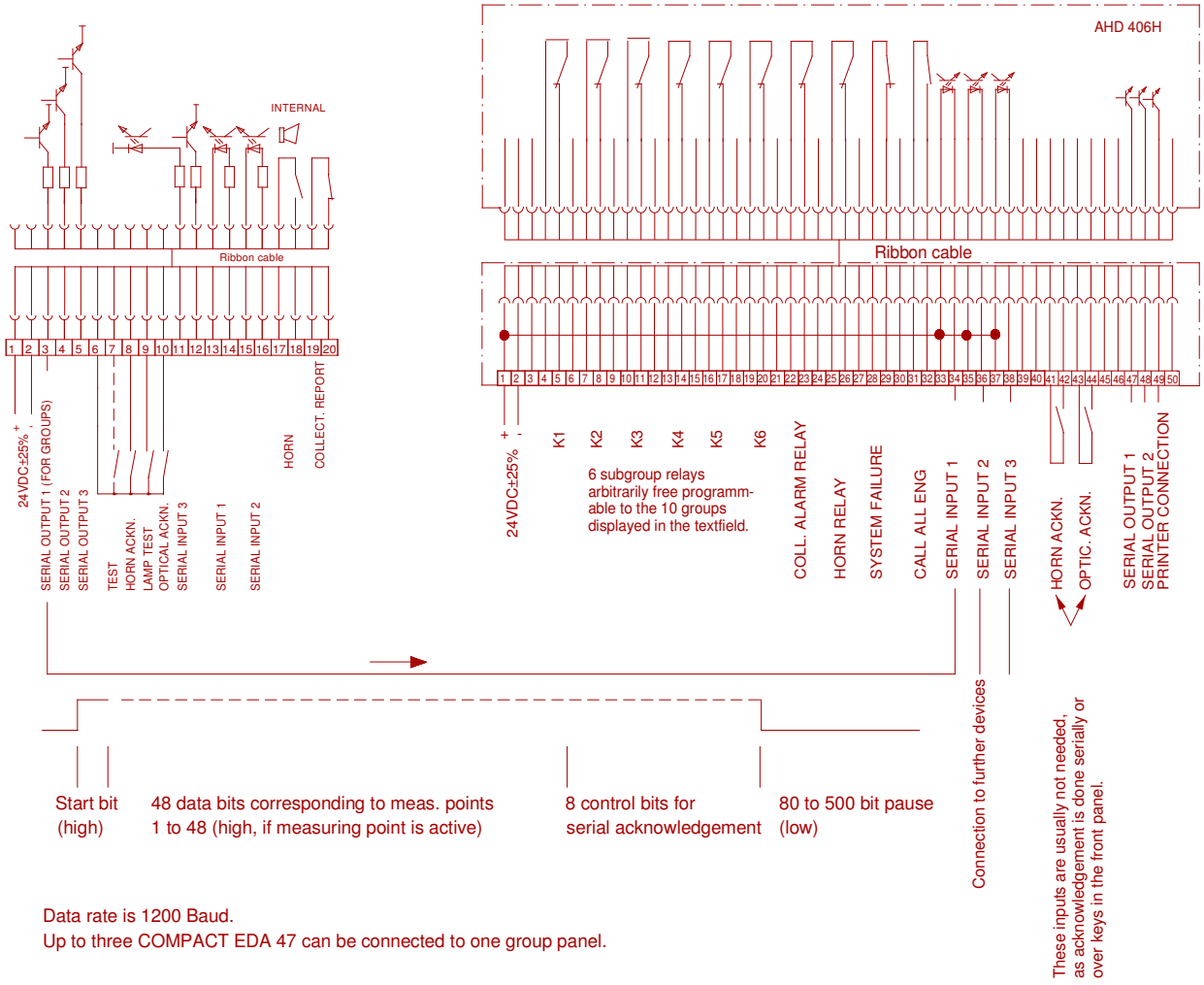
406hie.mcd

Alarm- and monitoring-systemCompact EDA 47

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48 Failure Data Transmission

Group panel AHD 406H





Data rate is 1200 Baud.
Up to three COMPACT EDA 47 can be connected to one group panel.

3.4 Acoustic acknowledgement

The horn relay can be reset with a key in the front panel or via a corresponding input on the terminal block. The horn relay can furthermore be acknowledged serially. Where the group panel receives data from KOMPAKT EDA 47 or from data distributor AHD W, acknowledgement signals are transmitted serially from there, too.

3.5 Visual acknowledgement

A flashing measuring point changes to steady light by visual acknowledgement. This can also becarried out with a key in the front panel or an input on the terminal block. Serial visual acknowledgement is also possible by means of by KOMPAKT EDA 47 or data distributor AHD W.

3.6 Multiple group address

A group is usually a combination of several individual messages. In the event of an alarm, a group message that is already activated but also acknowledged, is reactivated so that an individual report will not block the remaining alarms of the same group.

3.7 Lamp test

The key for visual acknowledgement in the front panel of the device also functions as a lamp test. All measuring points are illuminated while it is pushed.

3.8 Collective alarm and subgroup relays

Every alarm also causes switching of the collective alarm relay. In the event of a second alarm, the relay switches into normal position (closed) for app. 2s and then opens again (collective alarm repetition). A subgroup relay can be assigned to every measuring point, insofar as it is programmed to release an alarm message. If several measuring points affect one relay, that relay can operate as first value indicator or, like the collective alarm relay, as new value indicator.

3.9 Engineer call

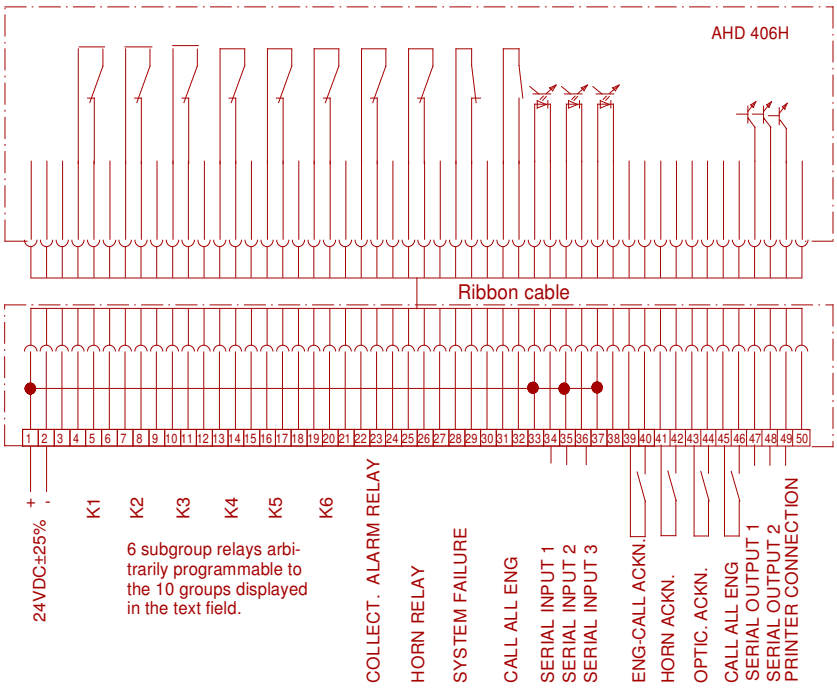
If an alarm is not acknowledged acoustically in the engine control room within 5 minutes (including serial alarms on the group panel), the relay CALL ALL ENG switches. It is led to the 50-pole terminal block as normally-closed-contact and reset after acknowledgement. Where chamber-/mess-room panels within the scope of a st.-by alarm system are connected to the device, the message will also be activated there serially.

3.10 System failure

AHD 406H has a relay that usually is normally closed. The contact that leads to the terminal block is then closed. In case of system failure or power failure the contact opens.

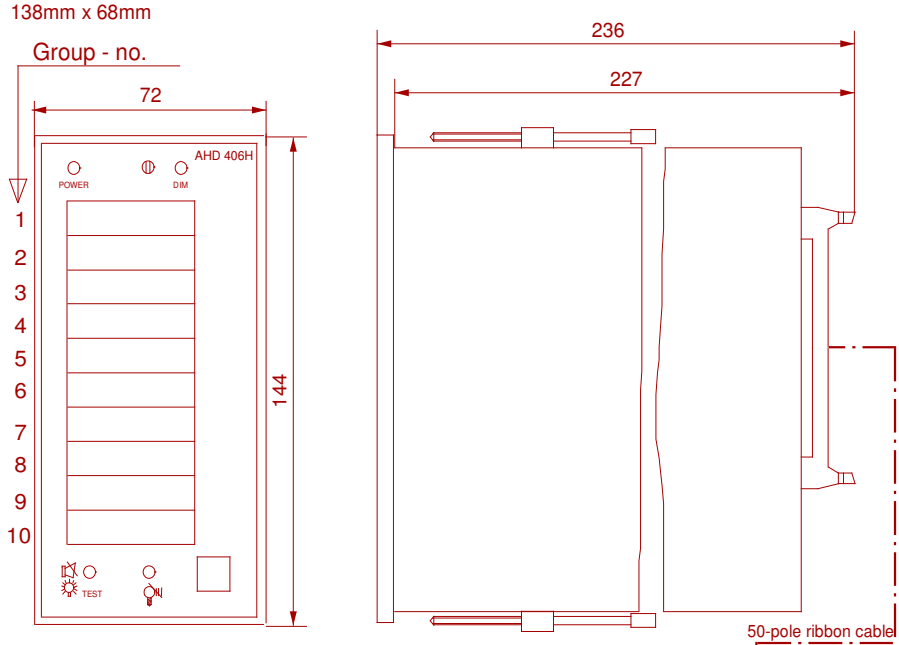
3.11 Dimming of display elements

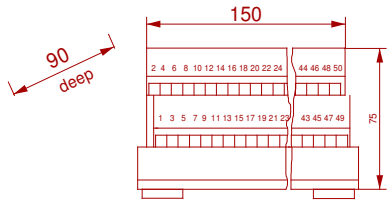
The construction of the device with a text field illuminated by surface LEDs has a photo resistor by which the lucency of the LED is dimmed automatically, depending on the ambient brightness. The maximal dimming in darkness can also be adjusted with a potentiometer in the front panel. Glaring or reflection in the windowpanes is thus avoided.



Techncal data

Power supply	:	24VDC +/-25%
Power consumption of electronic	:	appr. 0.3A
Loadability of relay contacts	:	1A, 48V
Perm. ambient temperature	:	0-65 °C
Perm. relative air humidity	:	99%
Degree of protection at front side	:	IP 20 (with front cap IP44)
Panel cutout	:	138mm x 68mm





Terminal block is mountable on rails TS 32 and TS 35

Short description

Over 3 serial inputs, the device can register up to 144 individual reports from up to 3 COMPACT EDA 47. Every individual report can be assigned aribtrarily to 0 to 2 groups. The groups can be defined as alarms (flash, horn relay switches) or displays. Additionally, 6 subgroups are available of which each can be assigned to any group displayed in the front panel. If an alarm group is not acknowledged for more than 5 minutes, the relay CALL ALL ENG. switches. A storage area for the texts to be printed (144 measuring points with 32 characters each) is located in the EEprom (tear out insertion). Two serial outputs are available for addressing the chamber- and messroom-panels.

Order-related technical specification for group panel AHD 406H

Group - no.	Meas. point text	Group relay (1 possible from K1 to K6)	Group as alarm (Al) or display (An)	LED-Color (red, yellow or green)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

GROUP RELAY DEFINITION	K1	K2	K3	K4	K5	K6
First value indicator						
New value indicator						

Length of ribbon cable: .....

The assignment of the individual reports according to the here mentioned groups has to be defined in the measuring point lists.

Client	
Shipyard	
Newbuilding	

Com-no. (Böning) 4-

Date: .....

406hp-e.mcd

SYSTEM-SPECIFIC PROGRAMMING

Serial input 1

Individual report no.	Eprom address 1st group	Content	Eprom address 2nd group	Content
1	1A00		1A30	
2	1A01		1A31	
3	1A02		1A32	
4	1A03		1A33	
5	1A04		1A34	
6	1A05		1A35	
7	1A06		1A36	
8	1A07		1A37	
9	1A08		1A38	
10	1A09		1A39	
11	1A0A		1A3A	
12	1A0B		1A3B	
13	1A0C		1A3C	
14	1A0D		1A3D	
15	1A0E		1A3E	
16	1A0F		1A3F	
17	1A10		1A40	
18	1A11		1A41	
19	1A12		1A42	
20	1A13		1A43	
21	1A14		1A44	
22	1A15		1A45	
23	1A16		1A46	
24	1A17		1A47	
25	1A18		1A48	
26	1A19		1A49	
27	1A1A		1A4A	
28	1A1B		1A4B	
29	1A1C		1A4C	
30	1A1D		1A4D	
31	1A1E		1A4E	
32	1A1F		1A4F	
33	1A20		1A50	
34	1A21		1A51	
35	1A22		1A52	
36	1A23		1A53	
37	1A24		1A54	
38	1A25		1A55	
39	1A26		1A56	
40	1A27		1A57	
41	1A28		1A58	
42	1A29		1A59	
43	1A2A		1A5A	
44	1A2B		1A5B	
45	1A2C		1A5C	
46	1A2D		1A5D	
47	1A2E		1A5E	
48	1A2F		1A5F	

Serial input 2

Individual report no.	Eprom address 1st group	Content	Eprom address 2nd group	Content
1	1A60		1A90	
2	1A61		1A91	
3	1A62		1A92	
4	1A63		1A93	
5	1A64		1A94	
6	1A65		1A95	
7	1A66		1A96	
8	1A67		1A97	
9	1A68		1A98	
10	1A69		1A99	
11	1A6A		1A9A	
12	1A6B		1A9B	
13	1A6C		1A9C	
14	1A6D		1A9D	
15	1A6E		1A9E	
16	1A6F		1A9F	
17	1A70		1AA0	
18	1A71		1AA1	
19	1A72		1AA2	
20	1A73		1AA3	
21	1A74		1AA4	
22	1A75		1AA5	
23	1A76		1AA6	
24	1A77		1AA7	
25	1A78		1AA8	
26	1A79		1AA9	
27	1A7A		1AAA	
28	1A7B		1AAB	
29	1A7C		1AAC	
30	1A7D		1AAD	
31	1A7E		1AAE	
32	1A7F		1AAF	
33	1A80		1AB0	
34	1A81		1AB1	
35	1A82		1AB2	
36	1A83		1AB3	
37	1A84		1AB4	
38	1A85		1AB5	
39	1A86		1AB6	
40	1A87		1AB7	
41	1A88		1AB8	
42	1A89		1AB9	
43	1A8A		1ABA	
44	1A8B		1ABB	
45	1A8C		1ABC	
46	1A8D		1ABD	
47	1A8E		1ABE	
48	1A8F		1ABF	

Serial input 3

Individual report no.	Eprom address 1st group	Content	Eprom address 2nd group	Content
1	1AC0		1AF0	
2	1AC1		1AF1	
3	1AC2		1AF2	
4	1AC3		1AF3	
5	1AC4		1AF4	
6	1AC5		1AF5	
7	1AC6		1AF6	
8	1AC7		1AF7	
9	1AC8		1AF8	
10	1AC9		1AF9	
11	1ACA		1AFA	
12	1ACB		1AFB	
13	1ACC		1AFC	
14	1ACD		1AFD	
15	1ACE		1AFE	
16	1ACF		1AFF	
17	1AD0		1B00	
18	1AD1		1B01	
19	1AD2		1B02	
20	1AD3		1B03	
21	1AD4		1B04	
22	1AD5		1B05	
23	1AD6		1B06	
24	1AD7		1B07	
25	1AD8		1B08	
26	1AD9		1B09	
27	1ADA		1B0A	
28	1ADB		1B0B	
29	1ADC		1B0C	
30	1ADD		1B0D	
31	1ADE		1B0E	
32	1ADF		1B0F	
33	1AE0		1B10	
34	1AE1		1B11	
35	1AE2		1B12	
36	1AE3		1B13	
37	1AE4		1B14	
38	1AE5		1B15	
39	1AE6		1B16	
40	1AE7		1B17	
41	1AE8		1B18	
42	1AE9		1B19	
43	1AEA		1B1A	
44	1AEB		1B1B	
45	1AEC		1B1C	
46	1AED		1B1D	
47	1AEE		1B1D	
48	1AEF		1B1F	

The 48th individual report is set automatically in case of failure of the serial data and can thus be evaluated, too.

Do not fill in addresses with content 00.

Program groups as alarm or display

Group	Eprom address	00 = Alarm 01 = Display
1	1A00	
2	1A00	
3	1A00	
4	1A00	
5	1A00	
6	1A00	
7	1A00	
8	1A00	
9	1A00	
10	1A00	

Activation of the serial inputs

serial input	Eprom address	00 = not active, 01 = active
1	1A00	
2	1A00	
3	1A00	

Assignment of the 6 subgroup relays to the 10 groups (only alarms)

Group	Eprom address	Subgroup relays (01 to 06 possible)
1	1BE6	
2	1BE7	
3	1BE8	
4	1BE9	
5	1BEA	
6	1BEB	
7	1BEC	
8	1BED	
9	1BEE	
10	1BEF	

Subgroup relay as first value or new value indicator

Subgroup relay	Eprom address	00 = First value ind. 01 = New value ind.
1	1BE0	
2	1BE1	
3	1BE2	
4	1BE3	
5	1BE4	
6	1BE5	

CONTROL AND MONITORING UNIT
AHD 406

- control and monitoring unit for flush mounting, front dimensions: 72mm x 144mm
- eight binary measuring points; two measuring points can be used as both binary and analog
- one input for alarm suppression
- three group relays, one horn relay
- one serial output
- connection with 50-pole ribbon cable and terminal block (part of delivery)
- text field can be exchanged easily
- GL classification

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

1. General

AHD 406 is a microprocessor controlled device mainly used for monitoring and controlling of engines. It meets the requirements of rough operating conditions on sea vessels such as high ambient temperatures, humidity, mechanical vibrations and peak voltage in the power supply.

2. Construction

AHD 406 consists of two electronic cards connected by threaded pins. The cards and the front panel form a plug-in unit located in a housing for control desk installation acc. DIN 43700. It consists of impact-resistant and self-extinguishing plastic.

The integrated circuits (IC) used on the electronic cards are plugged onto sockets and can be exchanged without soldering. This makes service extremely easy and even a technical layperson will be capable of repairing a defective device.

The plug-in unit can be removed after loosening of a captive screw. All inputs and outputs are led to a 50-pole plug acc. DIN 41651. A 50-pole terminal block and ribbon cable for the connection between the device and transfer unit are part of the delivery.

The system program containing information on computer reactions to external data is stored in an Eprom type 27C64 or EEprom type 28C64.

3. Function

The device starts monitoring upon connection with the power supply. Should one of the 10 possible external sensors react, the corresponding alarm is reported optically by a flashing LED in the front panel and acoustically by an external horn. Its delay times are programmable. At the same time, up to three group relays react activating alarm or control operations.

Function keys in the front panel

Optical acknowledgement: Flashing LEDs in the front panel show steady light after pressing this key. This function is enabled after the acoustic signal has been acknowledged.

Acoustic acknowledgement and lamp test: In the event of an alarm the horn can be deactivated by pressing this key. Otherwise the key enables the lamp test. Each function has an output on the external transfer unit.

T
E
S
T

Alarm test: The user can simulate the activation of all alarms with this key. Delays and group relays can thus be checked easily.

Acknowledged LEDs (steady light) go out when the corresponding channel no longer receives an alarm value. At the same time, the relevant group relays switch back to their normal status.

4. Versions

Two versions of the device are deliverable:

- Front panel with individual LEDs
- Front panel with illuminated and automatically dimmed text fields as required e.g. on ship bridges. A film negative text field is fixed on the illuminated area, so that only the text is transparent.

5. Adjustment of analog inputs

Where the customer requires alarm 9 and (or) 10 to be activated with a DC current signal 4-20 mA (analog mode), the device will be equipped accordingly. The switching points can be adjusted arbitrarily by means of spindle trimmers. The potentiometers are arranged on the lower circuit board of the plug-in unit. They are labeled with numbers according to their alarms 9/10.

The following applies for both trimmer-potentiometers:

switch to the right - switching point increases
switch to the left - switching point decreases

The following table serves for rough pre-adjustment of the switching points. Deviations are possible due to component tolerances.

Number of trimmer-potentiometer rotations to the right	Input signal (mA)
0	3.8
2	4.1
4	5.0
5	5.6
6	6.2
7	6.9
8	7.9
9	9.2
9.5	10.0
10	10.8
10.5	12.1
11	13.7
11.5	16.0
12	18.0
12.5	20.0

406AE.MCD

Content 00 → Alarm
Content 01 → Display

red, yellow or green

Content 00 → no suppression
Content 01 → suppression, if
Suppr. input activated (terminal 27/28)

Inhalt 00 → NC (Ruhestr.)
Inhalt 01 → NO (Arbeitsstr.)

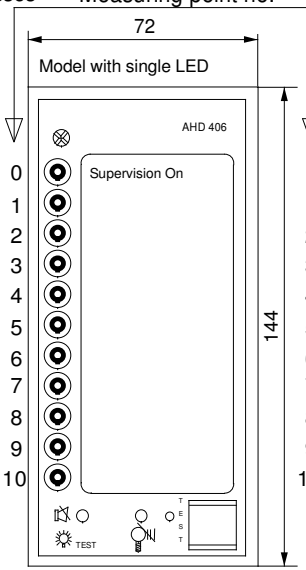
The group relays are addressed with the measuring points if the storage addresses have the content 01.

LED Color	Display/ Alarm		Alarm suppression		Input NC/NO		Group relays K3		K2		K1		Delay (Cont.+1s) dec	
	-	Display	-	-	1F40		-	-	-	-	-	-	1F00	03
red	1FD1		1F51	01	1F41		1F31		1F21		1F11		1F01	01
red	1FD2		1F52	01	1F42		1F32		1F22		1F12		1F02	01
red	1FD3		1F53		1F43		1F33		1F23		1F13		1F03	01
red	1FD4		1F54		1F44		1F34		1F24		1F14		1F04	01
red	1FD5		1F55	01	1F45		1F35		1F25		1F15		1F05	01
red	1FD6		1F56		1F46		1F36		1F26		1F16		1F06	10
red	1FD7		1F57		1F47		1F37		1F27		1F17		1F07	10
red	1FD8		1F58		1F48		1F38		1F28		1F18		1F08	01
red	1FD9		1F59		1F49		1F39		1F29		1F19		1F09	01
red	1FDA		1F5A		1F4A		1F3A		1F2A		1F1A		1F0A	01

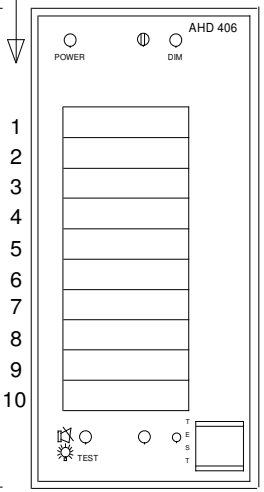
Storage addresses (E-Prom/EE-Prom)

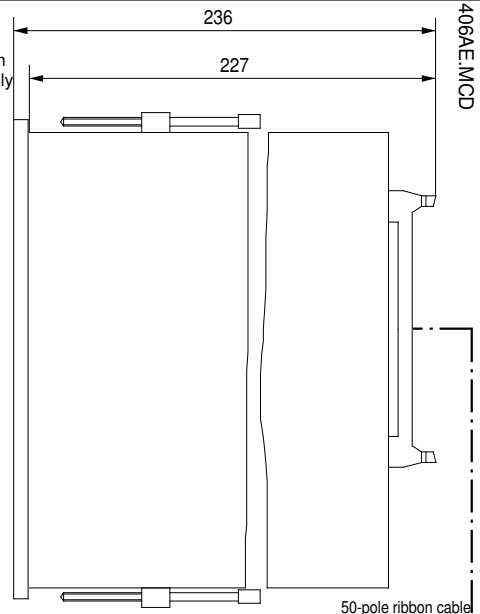
Caution:
Empty fields for storage addresses have the content "00".

Measuring point no.



Model with illuminated and automatically dimmed textfield.
Here, a film negative is placed on top of the illuminated area, so only the text will be visible.





Suppression input

1F00	

After deactivation of the input with terminals 27 and 28 and elapsing of the here entered time (0-99s), the usually suppressed measuring points are activated.

Suppression input

1F40	

Content 00 → NC (quiescent current)
Content 01 → NO (operating current)

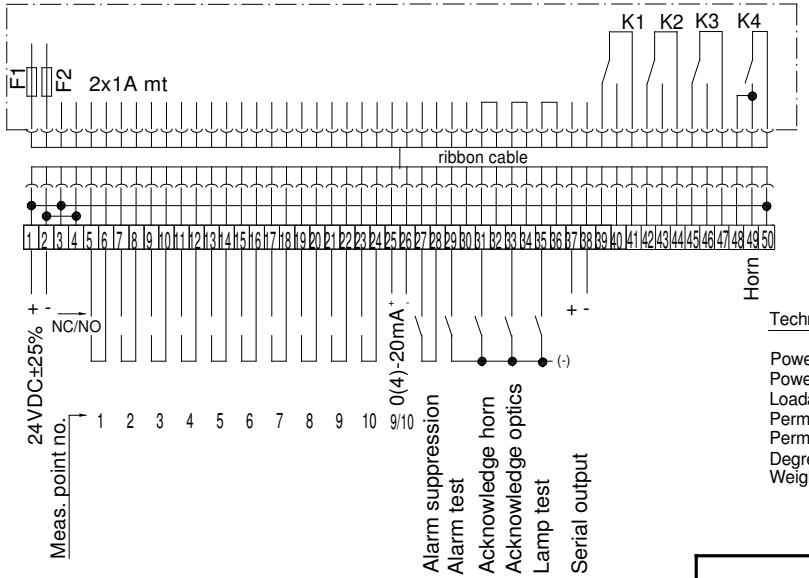
Relay		
K1	1F60	
K2	1F61	
K3	1F62	
K4	1F63	

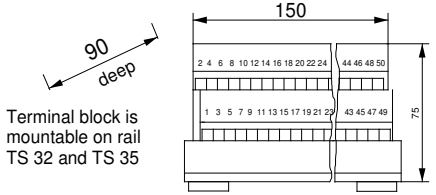
Content 00 → operating curr. relay
Content 01 → quiescent curr. relay

Relay		
K1	1F64	
K2	1F65	
K3	1F66	

Content 00 → new value indicator
Content 01 → first value indicator

The insertion has to be torn out of the housing to reach the storage. For this purpose, the round head bolt with cross head (upper left side in the front plate) has to be loosened.





Terminal block is mountable on rail TS 32 and TS 35

Technical data

Power supply	: 24VDC +/-25%
Power consumption of electronics	: appr. 0.3A
Loadability of relay contacts	: 2A, 48V
Perm. ambient temperature	: 0-65 °C
Perm. relative air humidity	: 99%
Degree of protection at front	: IP 20 (with front cap IP54)
Weight	: app. 1.5 kg

Device no. : .....
Length of ribbon cable : .....

406AE

ORDER-RELATED TECHNICAL SPECIFICATION

Alarm and Safety System AHD 414A

Alarm System **Safety System**

- alarm and safety system for control desk mounting
- 10 binary measuring points
- inputs can be delayed up to 99s
- 1 input for alarm suppression
- override function
- 3 arbitrarily programmable group relays and 1 horn relay
- 24 pole plug terminal block
- 1 serial input and 1 serial output
- wire break monitoring and stop circuit (safety system)
- acknowledgement is carried out on the front panel and externally via the terminal block
- type approved by ABS, BV, GL, LR, RMS

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

Alarm and Safety System AHD 414A

1) Features

AHD 414A is a microprocessor controlled device for control desk installation with 10 binary inputs for alarm or status messages. It has the following features:

- utilized for alarm or safety system
- individual solutions possible
- small, robust design
- 1 horn relay and 3 arbitrarily programmable group relays
- high current relay outputs
- serial interface
- wire break monitoring of the inputs and group relay K1 (stop relay in the safety system)
- low power consumption (app. 0.15A)

2) Assembly

AHD 414A consists of one electronic card with a processor system and all necessary peripheral components. The card is fixed to an aluminium front panel with 4 distance bolts. All ICs are plugged into sockets. The program is stored in an EPROM 27C64 or, if desired, in an EEPROM 28C64. The inputs and outputs connect to a 24 pole plug terminal block.

The unit is installed in a housing for control desk mounting acc. DIN 43700 with a front frame (dimensions: 144mm x 144mm, installation depth 53mm). A laser printed transparency on the front panel covered by a robust plastic foil is used for labelling. Both are fixed by the front frame.

3) Functions

3.1 Alarms/status messages

Each input is programmable to release either an alarm or a status message. The corresponding LED in the front panel flashes in the event of an alarm. Status messages are displayed by steady light. Alarms activate an internal buzzer and switch the horn relay. Alarms and status messages can be programmed to activate the group relays K1, K2 and/or K3.

3.2 Horn acknowledgement

The horn relay is acknowledged either by pushing the upper key on the front panel or externally by an input on the terminal block.

3.3 Optical acknowledgement

Flashing LEDs are permanently illuminated when the middle key in the front panel is pushed. There is furthermore an external input for optical acknowledgement via the terminal block.

3.4 Lamp Test

All measuring point LEDs are illuminated while the lamp test button is pushed.

3.5 Acknowledgement and resetting of alarms

As long as alarms are not acknowledged optically they are reported, irrespective of whether they are still present or not. The LEDs are not extinguished before the corresponding alarms are acknowledged optically and no longer active. Where the device is used as a safety system the RESET-key also has to be activated.

3.6 Group Relays

AHD 414A has 3 group relays which can be assigned to every alarm. It is also possible to assign several group relays to one alarm. The group relays can be programmed to indicate only the first or every new alarm value. They can furthermore be programmed to be normally closed or open. If the device is used as a safety system, the first group relay K1 always operates as normally open and first-value-indicator.

3.7 Wire Break Monitoring (safety system only)

The inputs and group relay K1 can be monitored to detect wire break. Therefore Z-diodes BZX 7V5 have to be installed parallel to the contacts. Wire break monitoring of the relay takes place by means of a low test current (app. 4mA) flowing through the coil, its interruption releasing an alarm. The lowermost LED is used as a wire break indicator. If only this lower LED flashes, the wire break report refers to group relay K1. In the event of further LEDs flashing, this refers to the corresponding input circuits. The flash phase is shifted by 180° to ensure a clear distinction between the actual alarms and the wire break report.

3.8 Alarm Blocking

AHD 414A has an input (measuring point 1) used for blocking/suppressing alarms. The upper LED is assigned to this input.

3.9 Override (ship has priority before engine)

If the device is used as safety system, relay K1 (stop relay) can be assigned to an override function. Every stop alarm can be programmed as inferior or superior to the override function. This normally affects all stop alarms except “overspeed”. Override functions as follows:

Where a stop criterion is activated for which the override function is programmed, relay K1 does not react if the override input is active. The engine therefore does not stop. In the event of the override input having been inactive when the alarm occurred, the stopping of the engine can be prevented by delayed activation of the override input (activated relay K1 switches off). The prerequisite for this is that the engine is still running at a speed higher or equal to idling speed. Should a stop alarm be active without stopping the engine, due to the active override input, this can be revised by deactivating “Override”. In this case the engine would stop belatedly. In the event of a stop criterion (e.g. overspeed) not assigned to the override function, the engine is always stopped.

3.10 Serial Communication

AHD 414A has a serial input that can only be used for customer-specific special functions. The following information is available at the serial output (1200 Baud):

Startbit (high), 12 bits corresponding to measuring points 1 to 11 (alarm system), 1 to 12 (safety system) from top to bottom (high, if measuring point is active, low if inactive), 3 bits corresponding to the group relays K1 to K3 (active group relay results in high-bit).

It is possible i.a., to transmit information to the alarm system DZA 02 or to the relay station AHD R101 via its serial interface and a data distributor AHD W (see last page of this documentation).

4) Labelling/Programming

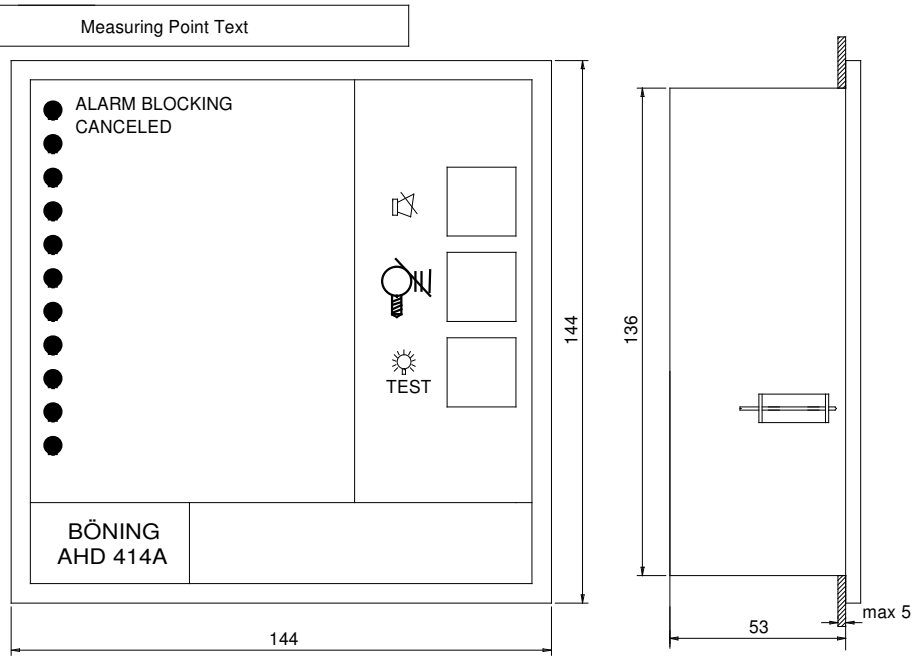
The measuring point list and the programming list on pages 5 and/or 6 must be filled out by the customer depending on whether the device is used as alarm or safety system. Following this, the device is programmed accordingly. As mentioned in 2), a laser printed transparency is utilized for labelling the front panel. An AutoCad-file with the template for the transparency is provided upon request for labelling by the customer

All programmed settings can be changed by using a programming device for Eproms and/or Eeproms, which can be done by the user. The address contents and relevant functions can be found in the aforementioned measuring point and programming list.

Empty fields for EPROM-addresses have the content "00". Exceptions are the addresses for the delays. They have, as far as not filled out, the content "01". Please only make entries, if changes are required.

414A-ALE.MCD

Measuring Point No.	Alarm/ Display		Delay		Group Relays K1		K2		K3		Input NC/NO (Rest/Operation)		Suppression by meas. point 1		LED color (red, yellow or green)
	EPROM Address	Display=01 Alarm=00	EPROM Address	Cont. (sec)	EPROM Address	switches if cont. 01	EPROM Address	switches if cont. 01	EPROM Address	switches if cont. 01	EPROM Address	NC = 00 NO = 01	EPROM Address	yes=01 no=00	
1	-	-	1F00		-	-	-	-	-	-	1F40		-	-	green
2	1Fd1		1F01		1F11		1F21		1F31		1F41		1F51		
3	1Fd2		1F02		1F12		1F22		1F32		1F42		1F52		
4	1Fd3		1F03		1F13		1F23		1F33		1F43		1F53		
5	1Fd4		1F04		1F14		1F24		1F34		1F44		1F54		
6	1Fd5		1F05		1F15		1F25		1F35		1F45		1F55		
7	1Fd6		1F06		1F16		1F26		1F36		1F46		1F56		
8	1Fd7		1F07		1F17		1F27		1F37		1F47		1F57		
9	1Fd8		1F08		1F18		1F28		1F38		1F48		1F58		
10	1Fd9		1F09		1F19		1F29		1F39		1F49		1F59		
11	1FdA		1F0A		1F1A		1F2A		1F3A		1F4A		1F5A		



Relay	Eprom-address	
K1	1F60	
K2	1F61	
K3	1F62	
K4	1F63	

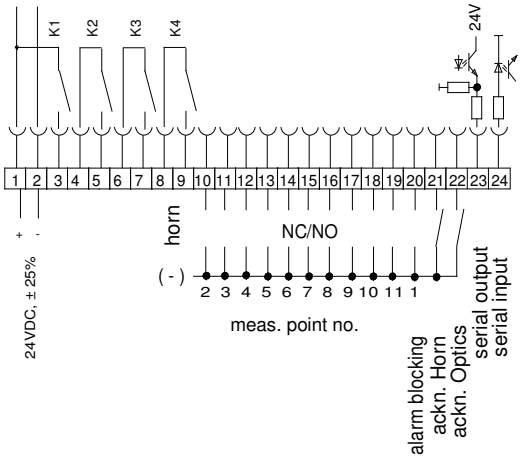
Cont. "00" - operating curr. relay

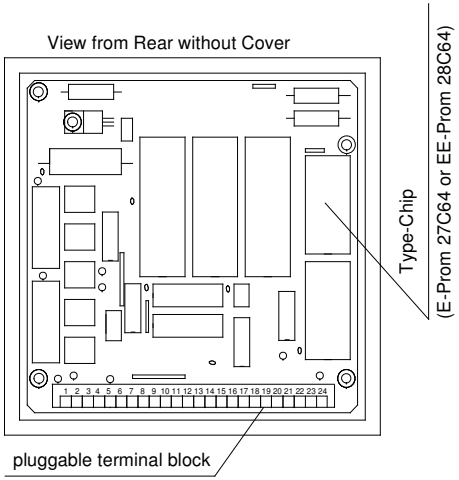
Cont. "01" - rest current relay

Relay	Eprom-address	
K1	1F64	
K2	1F65	
K3	1F66	

Content "00" = Relay operates as new-value-indicator

Content "01" = Relay operates as first-value-indicator





TECHNICAL DATA

Power supply	: 24VDC ± 25% or 12VDC
Consumption of electronics	: app. 0.15 A
Perm. load of relay contacts	: 3A, but total of 5A, 50VDC/AC
Serial interface	: TTY, standard edition 1200 baud, startbit (high) 11 data bits corresp. to meas. point 1 to 11, 1 x low, group relays K1, K2 and K3, app. 20ms to 100ms pause (low),
Perm. relative air humidity	: 99%
Panel cutout	: 138 mm x 138 mm
Protection class at front	: IP 54
Installation depth	: 53 mm
Weight	: 0.5 Kg

Alarm and Safety System AHD 414A

Meas. Point and Programming List for Alarm System AHD 414A

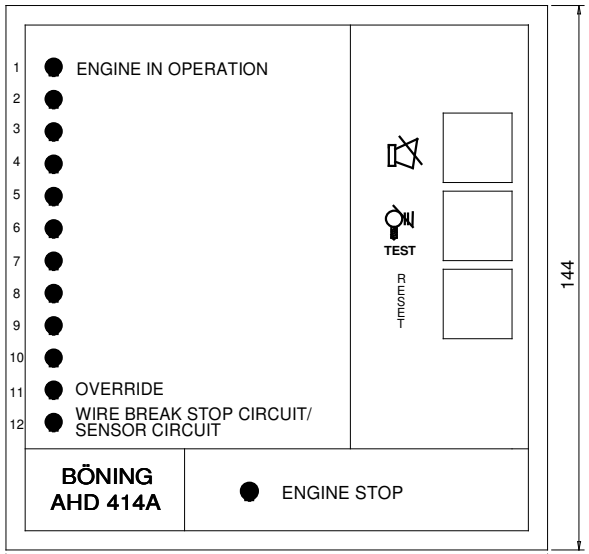
Empty fields for EPROM-addresses have the content "00". Exceptions are the addresses for the delays. They have, as far as not filled out, the content "01". Please only make entries, if changes are required.

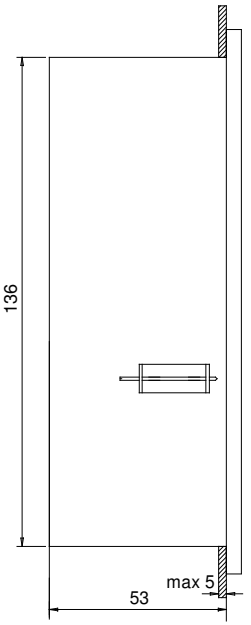
Measuring point no.	Alarm / Display		Delay		Group relays K1		K2		K3		Input NC/NO (Rest/Operation)		Suppression by meas. point 1		Wire break supervision		Override		LED Color (red, yellow or green)
	EPROM Address	Display=01 Alarm=00	EPROM Address	Cont. (sec)	EPROM Address	switches if cont. 01	EPROM Address	switches if cont. 01	EPROM Address	switches if cont. 01	EPROM Address	NC = 00 NO = 01	EPROM Address	yes=01 no=00	EPROM Address	yes=01 no=00	EPROM Address	yes=01 no=00	
1	-	-	1F00		-	-	-	-	-	-	1F40		-	-	-	-	-	-	green
2	1Fd1		1F01		1F11		1F21		1F31		1F41		1F51		1FF1		1EF1		
3	1Fd2		1F02		1F12		1F22		1F32		1F42		1F52		1FF2		1EF2		
4	1Fd3		1F03		1F13		1F23		1F33		1F43		1F53		1FF3		1EF3		
5	1Fd4		1F04		1F14		1F24		1F34		1F44		1F54		1FF4		1EF4		
6	1Fd5		1F05		1F15		1F25		1F35		1F45		1F55		1FF5		1EF5		
7	1Fd6		1F06		1F16		1F26		1F36		1F46		1F56		1FF6		1EF6		
8	1Fd7		1F07		1F17		1F27		1F37		1F47		1F57		1FF7		1EF7		
9	1Fd8		1F08		1F18		1F28		1F38		1F48		1F58		1FF8		1EF8		
10	1Fd9		1F09		1F19		1F29		1F39		1F49		1F59		1FF9		1EF9		
11	1FdA		1F0A		1F1A		1F2A		1F3A		1F4A		1F5A		1FFA		-		
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
															1FFB				

Wire break supervision relay circuit K1

414asi5e.MCD

Measuring Point Text



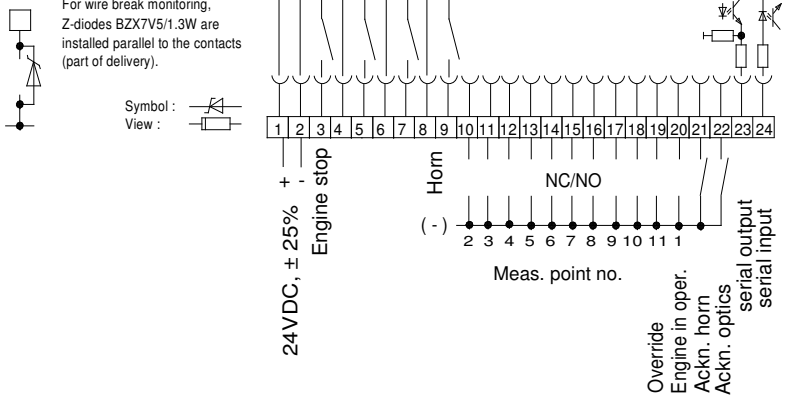


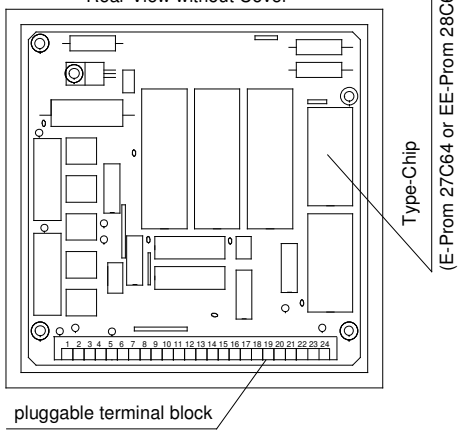
Relay	Eprom-address	
K2	1F61	
K3	1F62	

Cont. "00" - operating curr. relay
Cont. "01" - quiesc. current relay

Relay	Eprom-address	
K2	1F65	
K3	1F66	

Content "00" = Relay operates as new-value-indicator
Content "01" = Relay operates as first-value-indicator



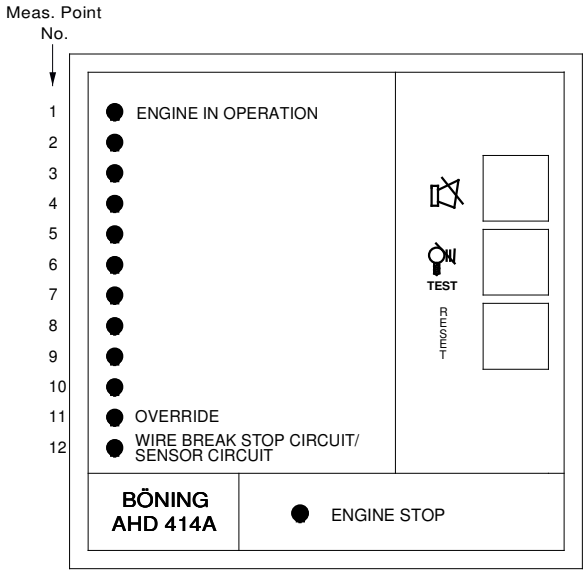


TECHNICAL DATA

Power supply	: 24VDC ± 25% or 12VDC
Consumption of electronics	: app. 0.15 A
Perm. load of relay contacts	: 3A, but a total of 5A, 50VDC/AC
Serial interface	: TTY, standard edition 1200 baud, startbit (high) 12 databits corresp. to LED 1 to 12 in the front panel, group relays K1, K2 and K3, app. 20ms pause (low),
Perm. relative air humidity	: 99%
Panel cut-out	: 138 mm x 138 mm
Protection class at front	: IP 54
Installation depth	: 53 mm
Weight	: 0.5 Kg

Measuring Point and Programming List for Safety System AHD 414A

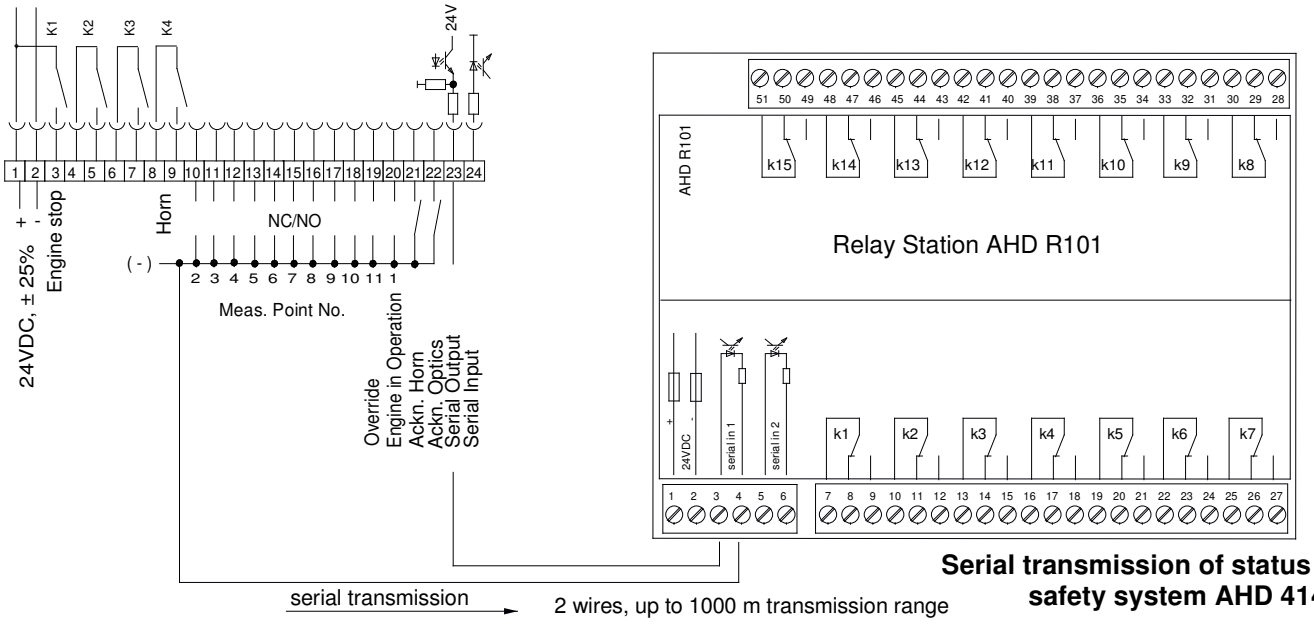
Alarm and Safety System AHD 414A



dd6.doc

This example shows safety system AHD 414A. It has a serial output that transmits, in cycles of less than 0.3s, the 15 status reports listed below. With the relay station, they can be assigned to relays 1 to 15.

One standard application is to assign measuring points 1 to 12 to relays 1 to 12, and group relays 1 to 3 to relays 13 to 15. As the relay station contains a microprocessor system, almost any arbitrary assignment can be realized. On request, we can offer the relevant software adjustments.



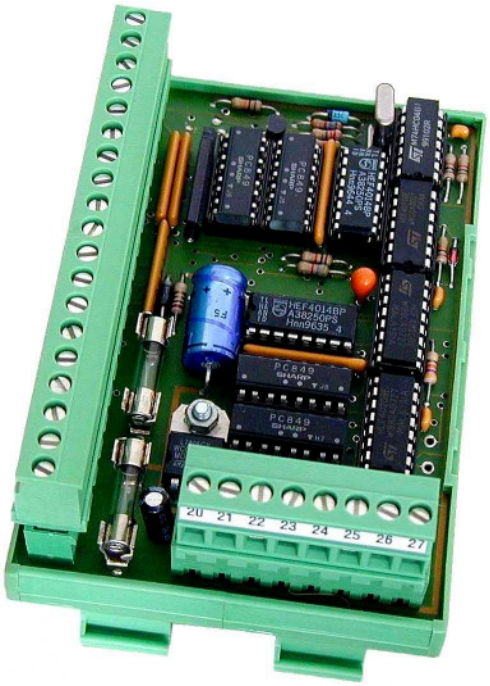
Serial transmission of status reports from the alarm and safety system AHD 414A with parallel output.

Alarm System AHD 530 with Serial Data Input

- desk installation device AHD 530
- 72 mm x 144mm x 38mm installation depth
- nine illuminated and automatically dimmed measuring points
- activated serially by Binary Station PS 47-1-15 or Analog Data Station AHD 903-15
- every message can be programmed as alarm or display
- each message can block every other message
- protection class IP 66 on the front panel

3 wires including power supply

to next AHD 530 if available



- Binary Data Station PS 47-1-12 with 12 optocoupler inputs for rail mounting (TS 32 or 35)
- inputs 1 to 9 correspond to text fields 1 to 9 of AHD 530
- converts contacts or other switches into a serial output signal, one or more AHD 530 are connected by 3 wires incl. power supply

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

Meas. point no.	Measuring point text	Color of illu-minated field	Opener	Shutter	Display	Alarm	Switch-on delay (1 - 60s)	Switch-off delay (1 - 60s)	Suppression (blocking) by input
1									
2									
3									
4									
5									
6									
7									
8									
9									

Measuring point list is to be filled out by customer.

General

The alarm system consists of a binary data station PS 47-1-12 and one or more alarm systems AHD 530. The data station has 12 optocoupler inputs that are transformed into a serial output signal. The data are transferred to the alarm systems by a single wire. They assign the inputs 1 to 9 to the alarms 1 to 9.

Each measuring point can be programmed to handle either NC or NO contacts and can also have a switch-on and/or switch-off delay (1 to 60s) and furthermore an alarm or message function. Every input can moreover be blocked (activated) by any other input.

Data Station PS 47-1-12

The device is constructed for installation in a housing (e.g. terminal box) and is mounted on a rail (TS 32 or TS 35). The terminal blocks are pluggable. PS 47-1-12 transforms 12 inputs into a serial output signal. Thus minimising the required wiring.

Alarm System AHD 530

The device for control desk mounting is fitted with a gasket for waterproofing. The front panel is protected by seawater and UV light resistant foil. Both protective measures accord to protection class IP 66 for the front panel. The device can thus be used indoors and outdoors. The message texts are displayed on a film negative which is fixed behind the foil. Each message is illuminated in a field with the dimensions of 38mm X 10mm when activated. The fields are either red, yellow or green. The text fields are dimmed automatically by means of a photo resistor in the front panel.

Alarms

An alarm is signalled acoustically by an integrated buzzer and optically by flashing of the relevant message.

Messages

A new message does not activate the buzzer, but displays steady light immediately without prior acknowledgement.

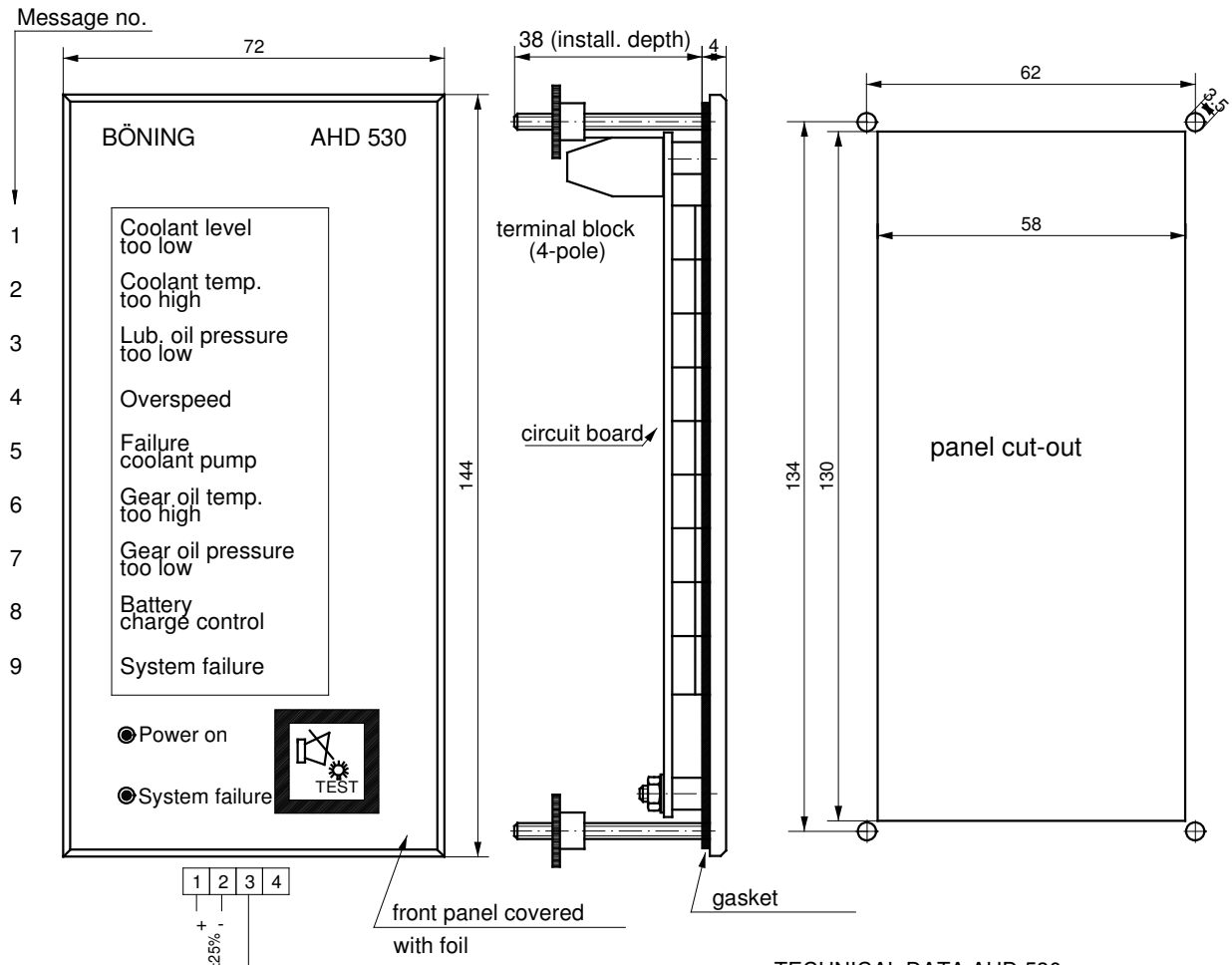
Acoustic and optic acknowledgement of alarms

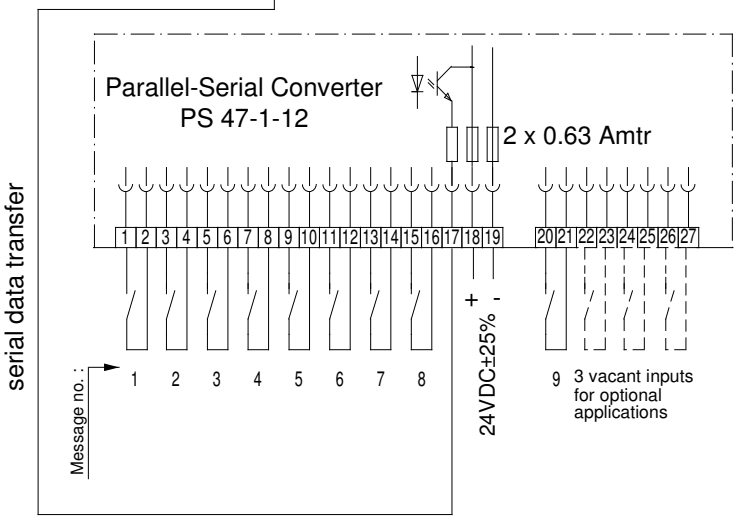
An alarm is acknowledged acoustically by pushing the key. After the key is released and pushed again the message is acknowledged optically and appears as steady light. As soon as the cause of the alarm has been removed the message illumination is turned off.

Lamp test

Where no alarm is activated the key has the function „lamp test“. As long as it is pushed, all message fields are illuminated.

The device is programmed ex works according to the specifications in the measuring point list. The relevant form can be found on the last page of this documentation. Possible changes such as during commissioning, still necessitate exchange of the Eprom. Menu-controlled programming via notebook is projected.



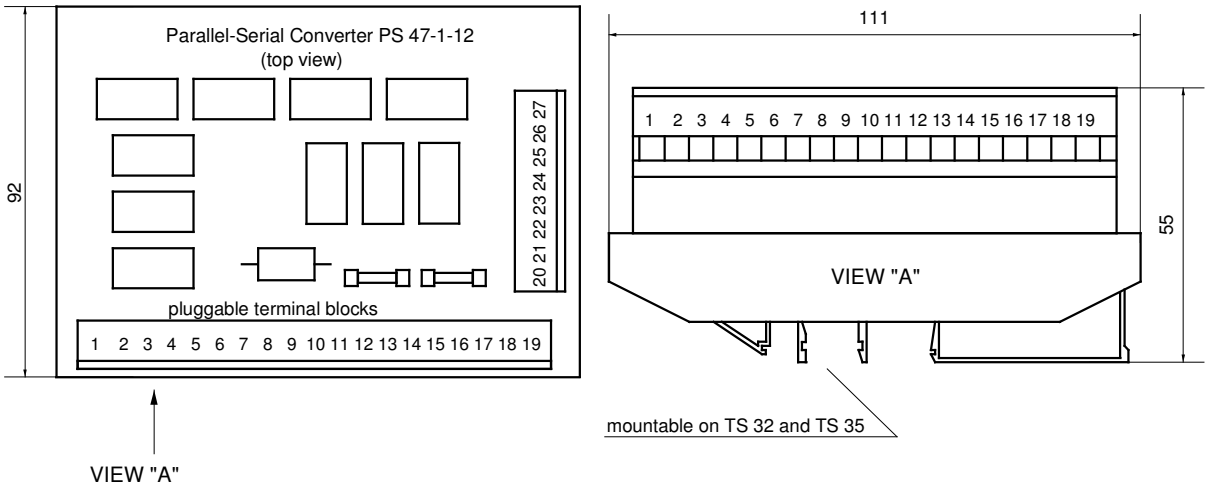


TECHNICAL DATA AHD 530

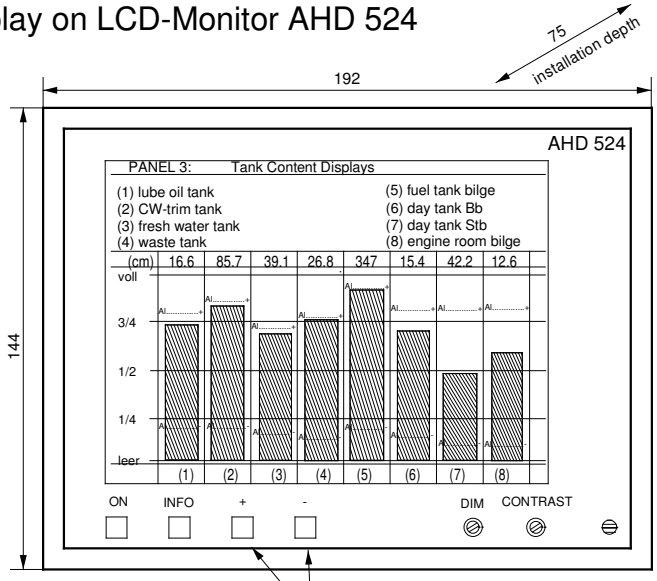
Power supply:	24VDC
Power consumption:	0.2A
Inputs:	1 x serial
Outputs:	1 x serial
Baudrate:	1200
Protection class:	IP 66 (at front side)
Weight:	0.2kg

TECHNICAL DATA PS 47-1-12

Power supply:	24VDC
Power consumption:	0.2A
Inputs:	12 x binary
Outputs:	1 x serial
Baudrate:	1200
Protection class:	IP 00
Weight:	0.2kg



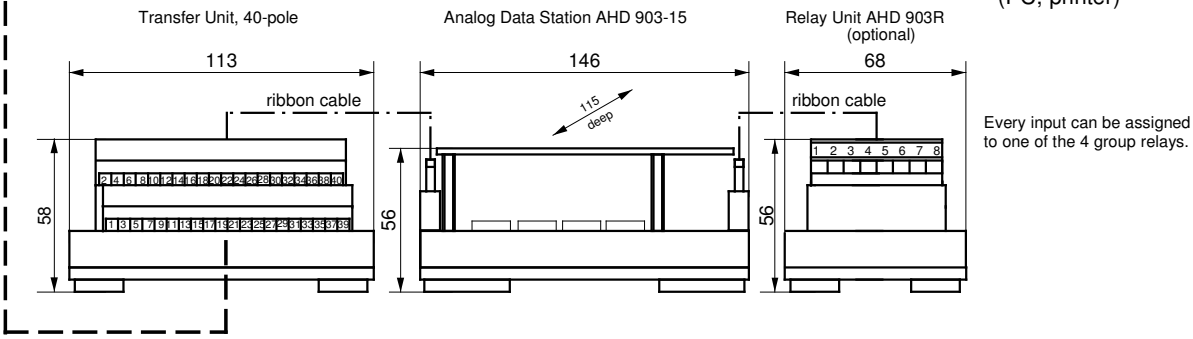
Decentralized data registration with AHD 903-15 and display on LCD-Monitor AHD 524



- device for control desk installation
- display and alarm system
- display as bar chart or tabular
- LCD-monitor 116 mm x 88 mm with automatically dimmed background illumination
- resolution 320 x 240 pixels
- several pages can be called up by keystroke
- programming over plug-in keyboard
- serial interfaces: current loop to substations AHD 903-15, 2 X RS232 for printer and PC-connection
- Alarm panel can be called up with the INFO-key
- integrated clock
- further displays can be connection in slave-function over only one wire
- type approved by ABS, BV, DNV, GL, LR

4-wire bus-cable incl. power supply

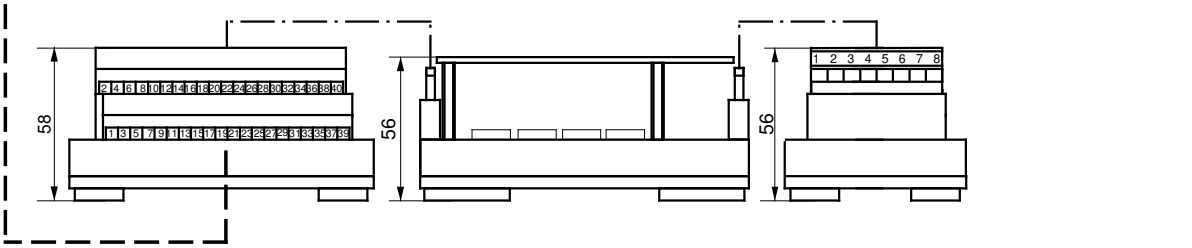
2 x RS232C
(PC, printer)



Every input can be assigned to one of the 4 group relays.

n -stations

- compact, addressable system for decentralized data registration by bus-coupling
- 15 inputs, mixed on request, 0(4)-20mA, 0(2)-10V, PT100, PT1000, binary
- precision measuring with reference compensation, filter and 12-bit-transformer-resolution
- serial output for direct connection with the alarm system EDA-47
- exhaust gas average value control, tank content measurement
- relay-module can be connected
- type approved by ABS, BV, DNV, GL, LR



BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

CONTENTS

Descriptions

Analog Data Station AHD 903-15

General	3
Construction of device	3
Data registration	4
Dimensional drawing	5
Terminal diagram	5
Technical Data AHD 903-15	5
Technical Data AHD 903R	5

LCD-Display AHD 524

General	6
Construction of device	6
Function	6
Interfaces	7
Dimensional drawing	8
Technical data	8
Terminal diagram	9

Configurations

Configuration of the analog data station AHD 903-15 and of the display AHD 524	10

Applications

Exhaust gas average value monitoring for diesel engines	11
Tank level measurement	12
15 measuring transducers with data station AHD 903-15 and relay unit AHD R101	13
Examples for page design of the display (masks)	14

Analog data station AHD 903-15

1. General

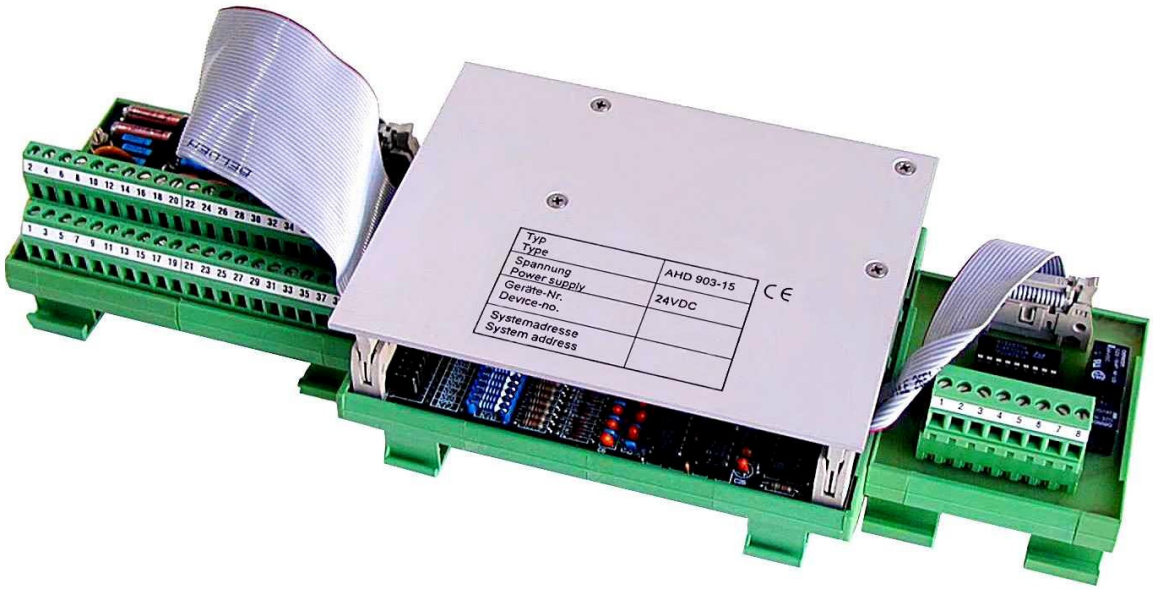
AHD 903-15 is a microprocessor controlled device that is mainly used for decentralized data registration. It is possible in principle, to connect any number of locally separated data stations (via a 4 wire bus, incl. power supply) and to call them up on the display AHD 524. The following problems can be solved by means of a variety of software solutions:

- general analog and binary data collection and alarm activation
- exhaust gas average value monitoring for diesel engines
- tank level measurement of different shaped tanks
- earth-fault monitoring e.g. of electric motors

2. Assembly of device

AHD 903-15 consists of an electronic card housed in a polymer case. It is connected to a 40-pole terminal block via a ribbon cable for the connection of all inputs and outputs and the power supply.

The device was subjected to a vibration test of 4g according to German Lloyd and is therefore classified for direct installation into terminal boxes of diesel engines.



3. Data registration

Up to 15 sensors can be connected single-pole or bipolar to an analog data station. The recorded measuring values are standardized internally, converted and made available for the display unit AHD 524 as numeric values. In addition, limiting values can be programmed. If the measured value lies outside of this range, the corresponding alarm is released. All alarms are available at a separate serial data output (terminal 4). If the system is connected to display unit AHD 524, the display receives the commands for data check or the configuration parameters by means of a bidirectional bus. Therefore data can be retrieved from multiple data stations by using different addresses. The data are returned to the display unit AHD 524 via the same bus.

In addition to the internal monitoring the microprocessor controlled system contains a special non-volatile memory module for configuration data storage (limiting values, input mode, range limits, etc.). The measuring value registration is carried out by a 12-bit A/D converter. Integrated reference compensation, as well as signal filtration at the input enable precise measuring results.

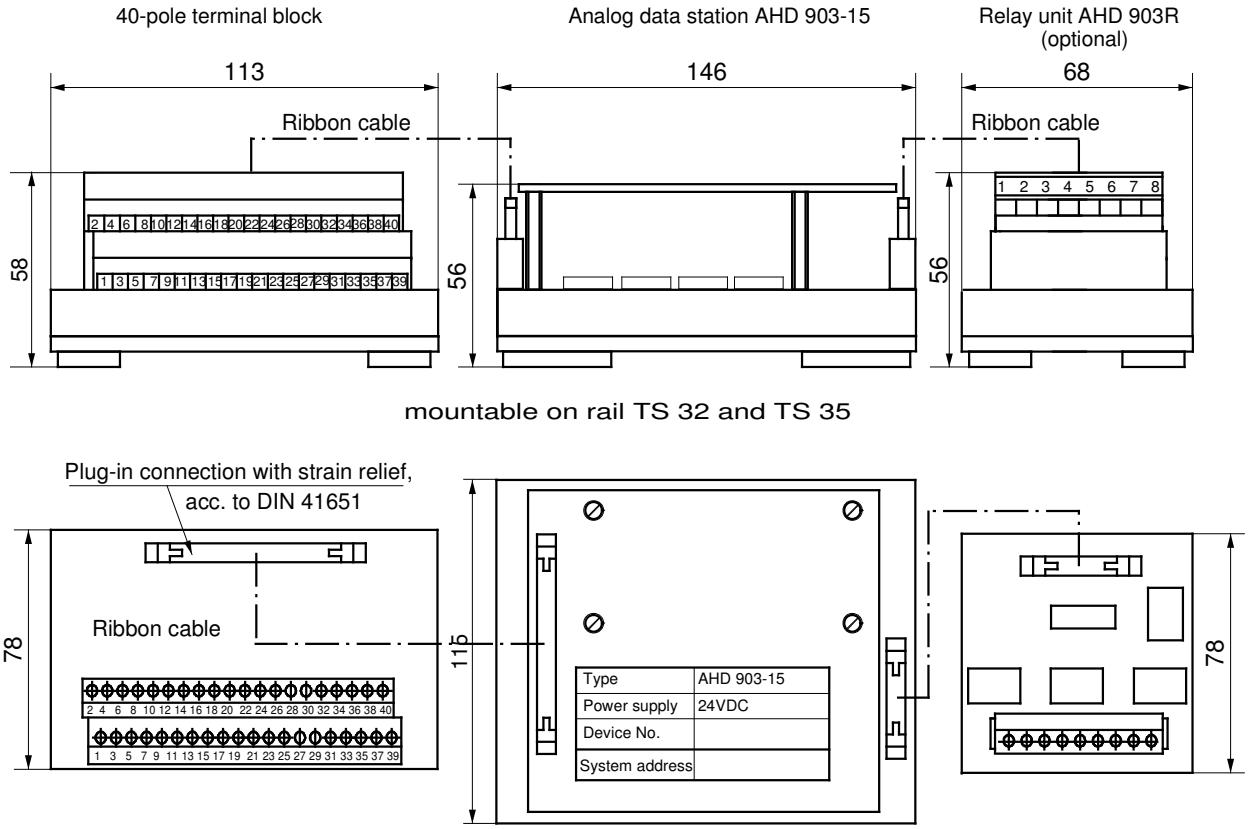
The following input values can be processed:

- 0...10V/1...10V
- 0...20mA/4...20mA
- PT100
- PT1000
- binary values

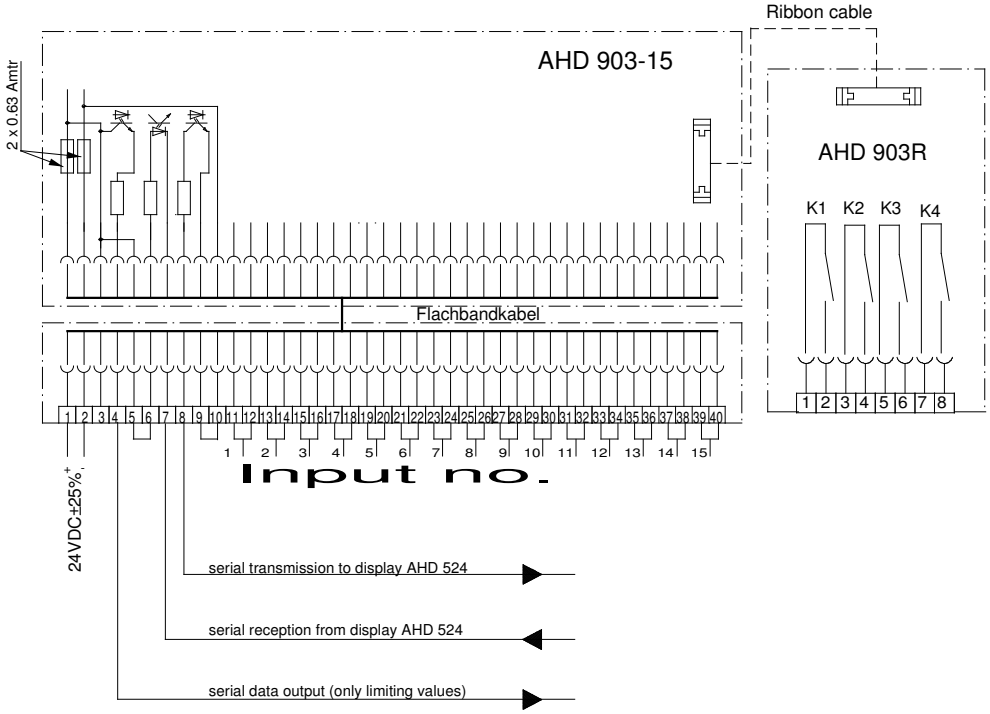
Others upon request.

DIMENSIONAL DRAWING

903-1-b.mcd



TERMINAL DIAGRAM



TECHNICAL DATA AHD 903-15

Power supply	: 24VDC ± 25%
Power consumpt. of electronics	: app. 0.15 A
Number of inputs	: 15
Type of input	: Pt100, Pt1000, 0(4)-20mA, 0(1)-10V
Input resolution	: 12 bits
Permissible rel. air humidity	: 99%
Protection class	: IP 00
Weight	: 0.5 Kg

TECHNICAL DATA AHD 903R

Number of relays	: 4
Permissible load of relays	: 1 A
Permissible voltage of relays	: 50VDC C
Permissible rel. air humidity	: 99%
Protection class	: IP 00
Weight	: 01 Kg

LCD-Display AHD 524

1. General

AHD 524 is a microprocessor controlled device for displaying measuring values and alarms. The display depicts them in tabular or graphic form and allows an arbitrary number of pages. In many cases the instrument can be a favorable alternative to PC-solutions.
It is possible to connect an arbitrary number of further displays (bridge, chambers, mess, ...) by means of a one wire connection plus power supply. The operation of the individual devices is independent of each other.

2. Device assembly

AHD 524 is a device for dashboard installation with front dimensions 192mm x 144mm and an installation depth of 75mm. It essentially consists of 2 electronic cards. The display is attached to one card fastened to the front panel and the other is fastened to the inside of the rear panel. Both cards are interconnected.

The aluminium panel front is additionally protected by a transparent polymer panel. It is operated by buttons installed in the front panel next to the photo-electric cell for automatic dimming of the LCD. The display illumination is adapted to the ambient brightness by means of additional electronic circuitry.

A 26-pole terminal block for electrical wiring is mounted on rail TS32 or TS35. It is connected to the display unit via a ribbon cable. Where the RS232C-interface is used, an additional 20-pole terminal block is required.

3. Function

The versatile display unit software sequentially queries all AHD 903-15 data stations connected to the communication bus which is carried out by using different addresses. The measured values are checked (check sum test) and displayed as bar charts or as numerical values in tabular form. Simultaneously, additional measuring point information such as measuring point text, limiting values and the unit of the measured value is shown.

The data received from AHD 903-15 data stations is distributed to one or more displays depending on the number of measuring points. Buttons on the front panel enable the user to browse through the pages. A maximum of 18 measuring values can be displayed on one page using the tabular mode, while the graphical mode can display a maximum of 8 measuring values including additional information. Tabular and graphic displays can be combined arbitrarily in one system.

The system has an additional memory component accessible from the rear, which permanently stores all configuration data such as AHD 903-15 limiting values, input modes, range limits etc. The actual LCD display window measures 116x88 mm and has a resolution of 320x240 pixels. The height of the characters is > 3mm. Modern STN - technology combined with the aforementioned automatically dimmed background illumination enables high contrast and a good readability.

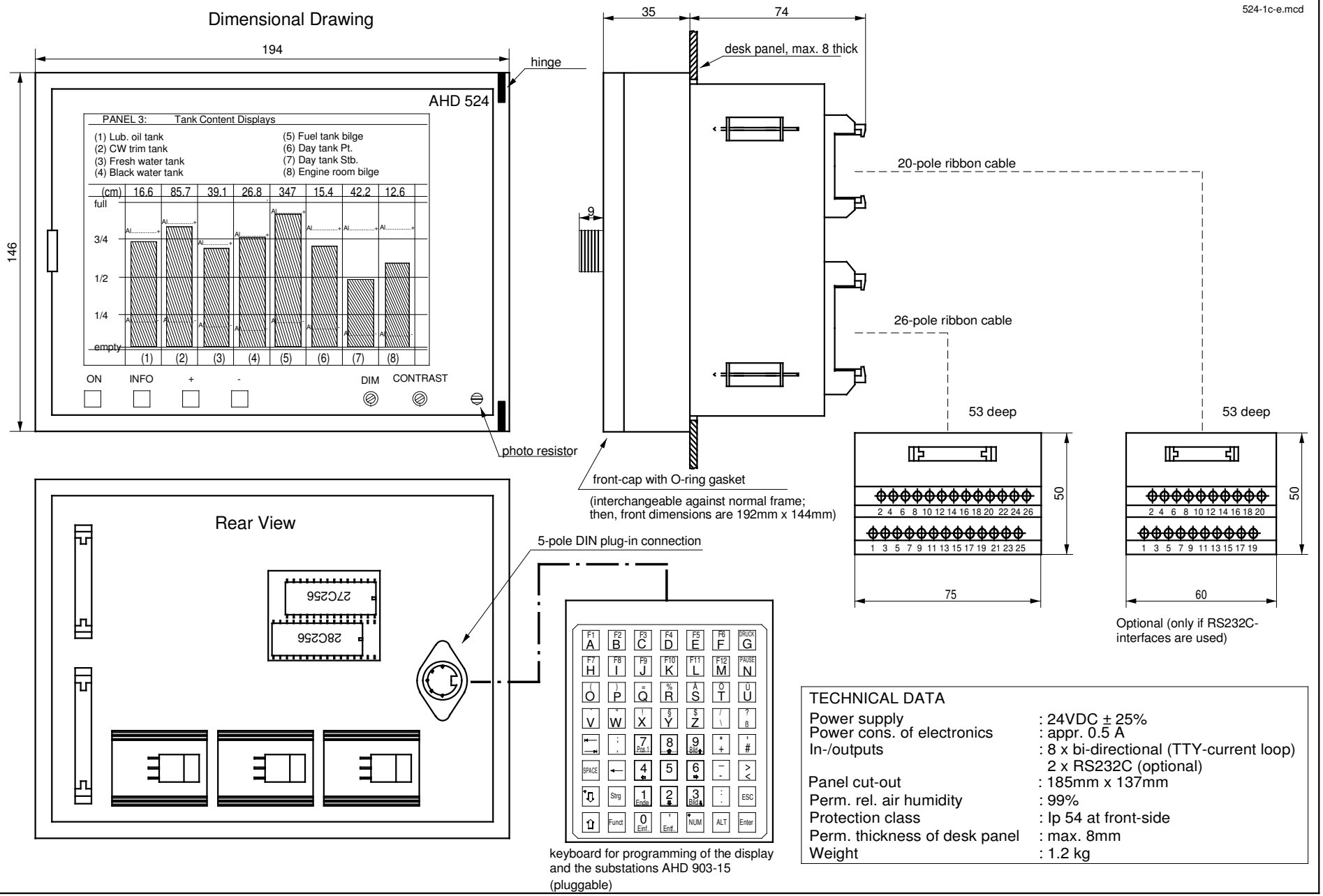
4. Interfaces

Apart from the bidirectional BUS-interface (current loop) for communication with AHD 903-15 data stations, there is an RS232-interface for connection of a serial printer as well as a vacant optional RS232-interface for data coupling with a PC.

There are 7 additional serial inputs and outputs using the same hardware as the interface for communication with the data stations.

Dimensional Drawing

524-1c-e.mcd



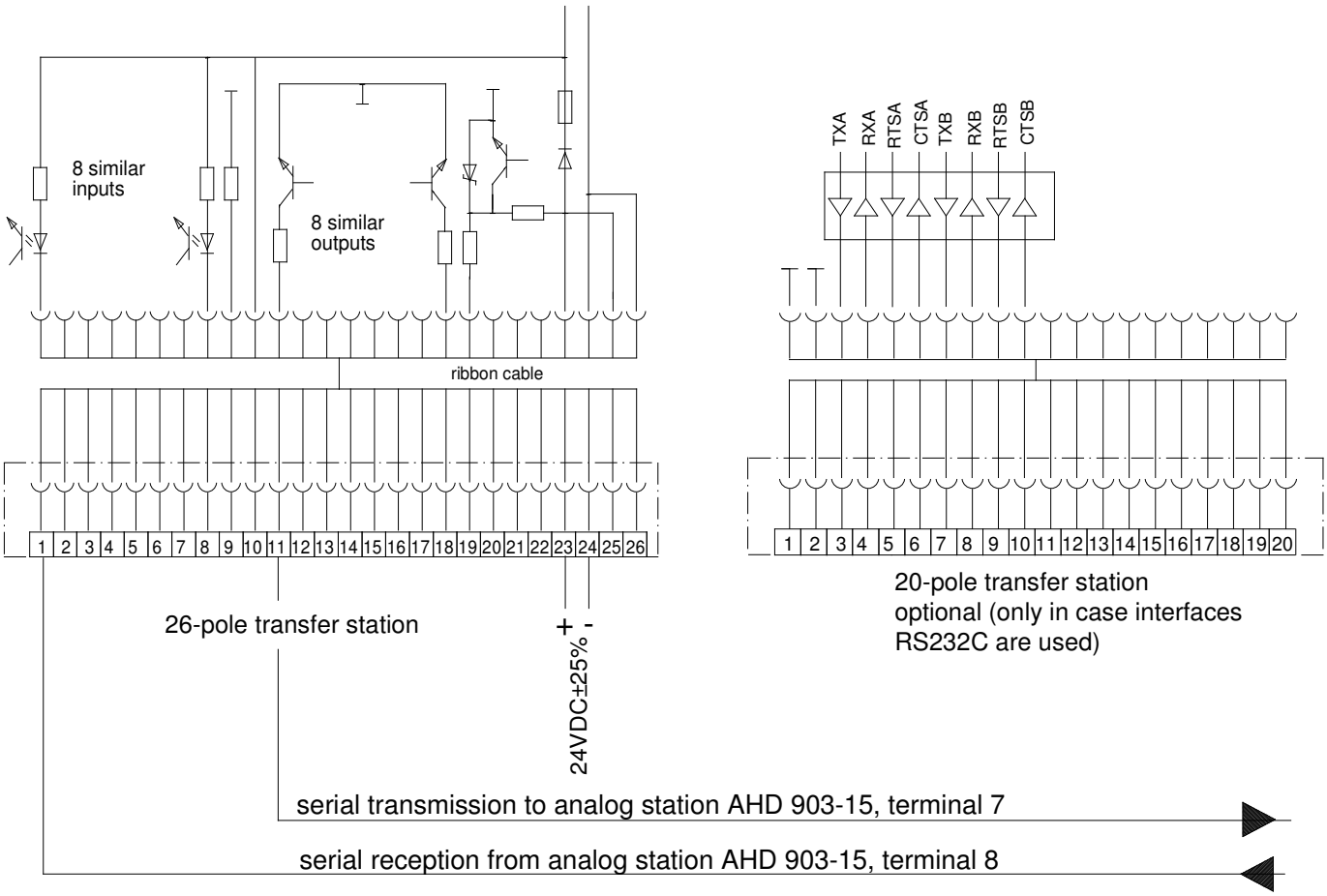
keyboard for programming of the display
and the substations AHD 903-15
(pluggable)

TECHNICAL DATA

Power supply	: 24VDC ± 25%
Power cons. of electronics	: appr. 0.5 A
In-/outputs	: 8 x bi-directional (TTY-current loop) 2 x RS232C (optional)
Panel cut-out	: 185mm x 137mm
Perm. rel. air humidity	: 99%
Protection class	: Ip 54 at front-side
Perm. thickness of desk panel	: max. 8mm
Weight	: 1.2 kg

Terminal Diagram

524-3ae.mcd



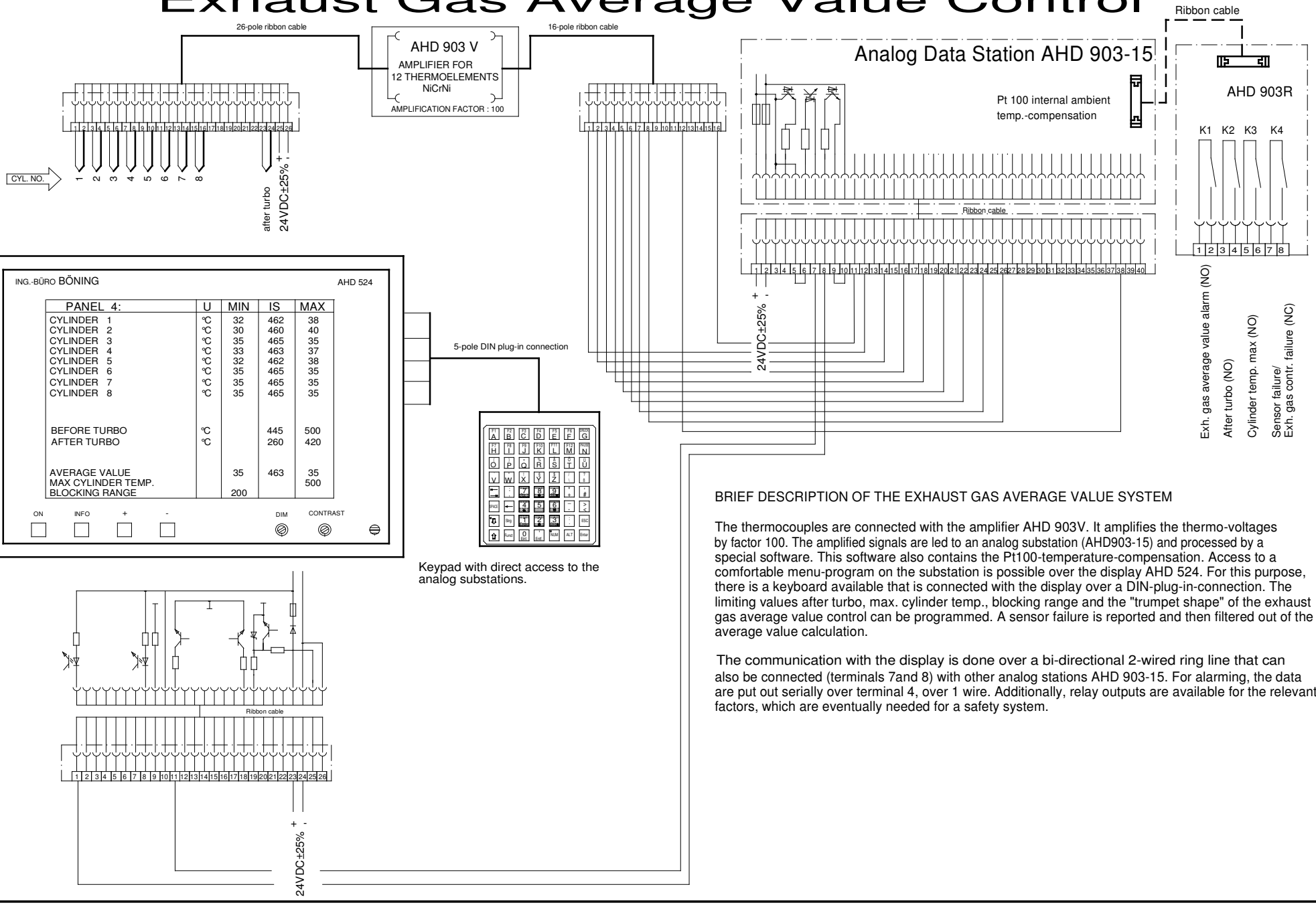
Configuration of AHD 903-15 analog data station and AHD 524 display

The complete system is programmed by means of a foil-keypad that can be connected to the display unit. The integrated configuration software is menu controlled and enables the direct setup of all important parameters on the LCD display without additional auxiliary tools. Simple and fast adjustment on site is therefore guaranteed.

The ex-works condition accords to customer specifications. This applies in particular to the masks for individual pages. The attached measuring point list is the basis for programming the analog data stations.

Exhaust Gas Average Value Control

524-2-E.MCD



BRIEF DESCRIPTION OF THE EXHAUST GAS AVERAGE VALUE SYSTEM

The thermocouples are connected with the amplifier AHD 903V. It amplifies the thermo-voltages by factor 100. The amplified signals are led to an analog substation (AHD903-15) and processed by a special software. This software also contains the Pt100-temperature-compensation. Access to a comfortable menu-program on the substation is possible over the display AHD 524. For this purpose, there is a keyboard available that is connected with the display over a DIN-plug-in-connection. The limiting values after turbo, max. cylinder temp., blocking range and the "trumpet shape" of the exhaust gas average value control can be programmed. A sensor failure is reported and then filtered out of the average value calculation.

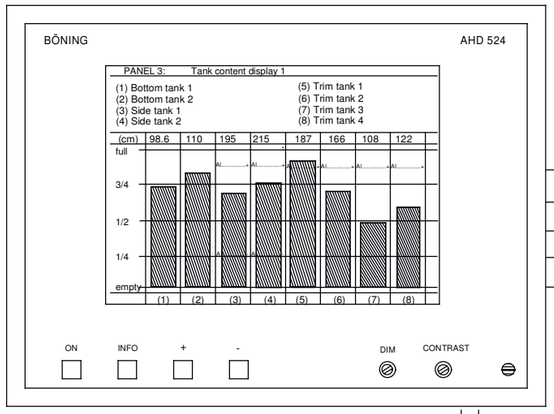
The communication with the display is done over a bi-directional 2-wired ring line that can also be connected (terminals 7and 8) with other analog stations AHD 903-15. For alarming, the data are put out serially over terminal 4, over 1 wire. Additionally, relay outputs are available for the relevant factors, which are eventually needed for a safety system.

TANK CONTENT MEASURING AND DISPLAY SYSTEM WITH ALARMING

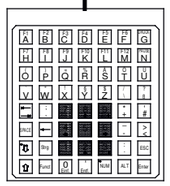
MASTER

Display pages can be called up by paging with the + and - keys or the info-key.

LCD-display; graphic-compliant, with autom. dimmed background illumination, 45 characters per line and 20 lines, various pages can be called up with keys, communicates with the analog data stations AHD 903-15, connection with PC and printer possible, integrated clock.



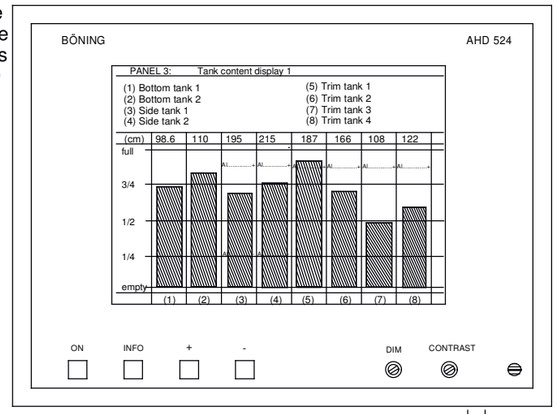
5-pole DIN plug-in connection

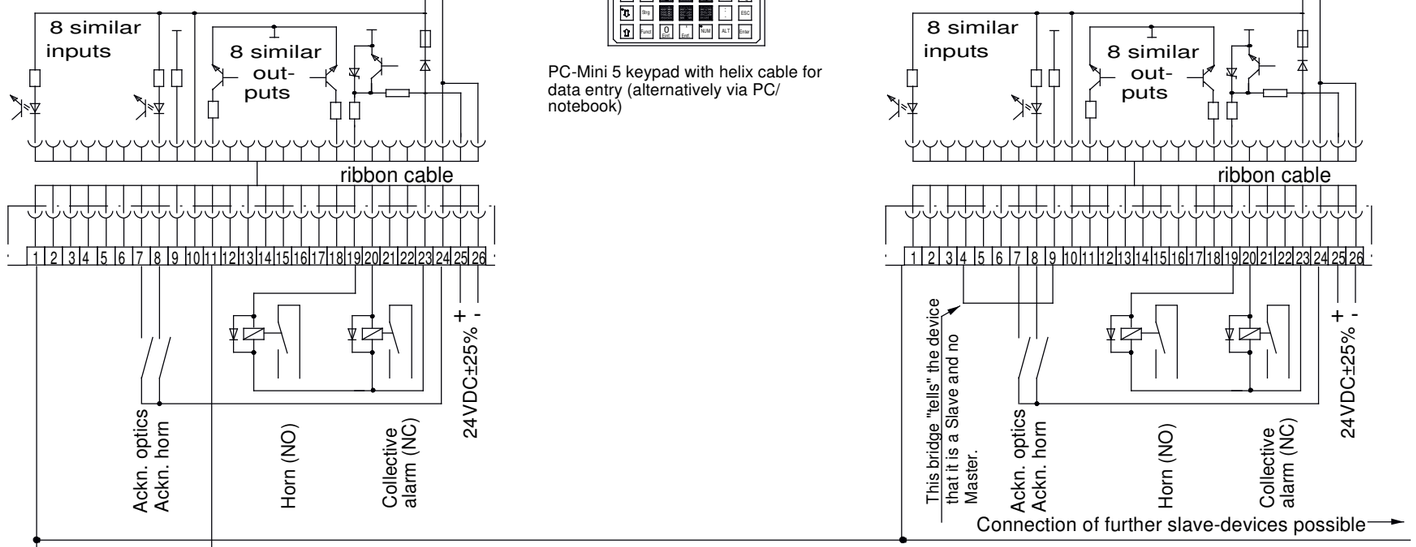


PC-Mini 5 keypad with helix cable for data entry (alternatively via PC/ notebook)

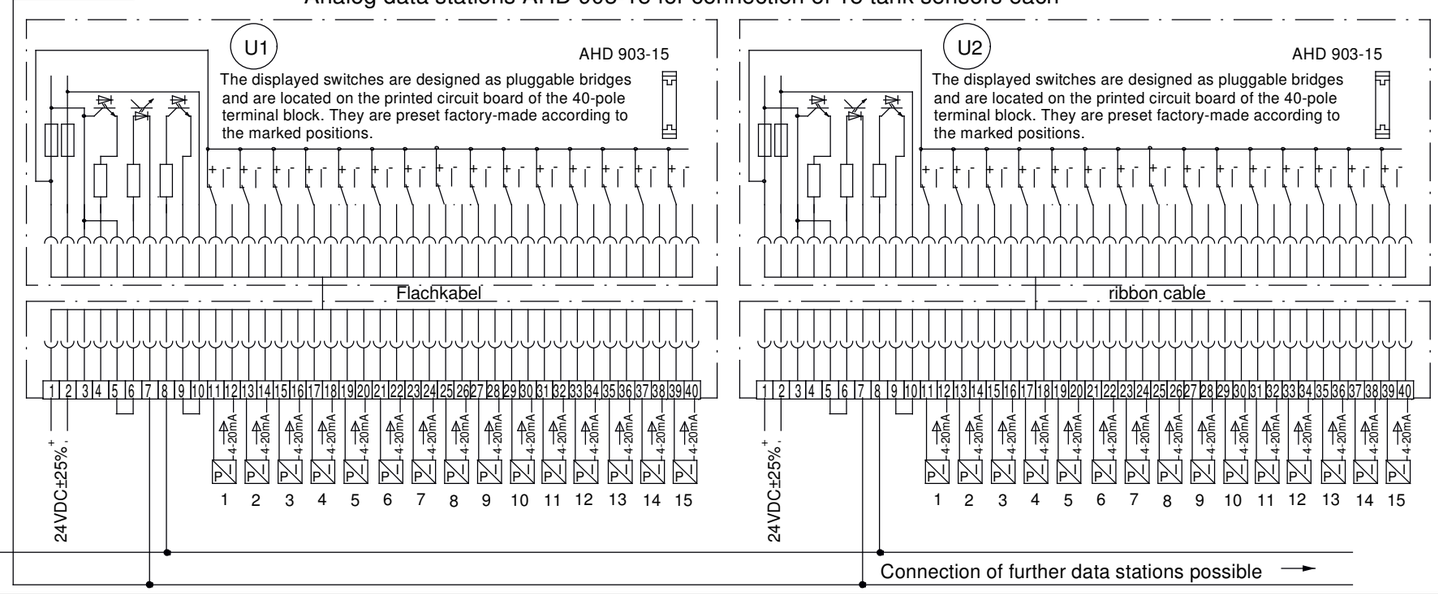
SLAVE

Display pages can be called up by paging with the + and - keys or the info-key.





Analog data stations AHD 903-15 for connection of 15 tank sensors each



Brief description

903524a.doc

In the displayed example, a total of 30 tanks are evaluated over 2 analog data stations. The stations can be placed locally separated, which means at convenient locations, in order to minimize wiring. Two AHD 524 displays are used her for display of the tank contents. The master-display communicates with the substations, while the slave-display remains passive. For this reason, only one wire is required between the two devices, which makes installation easy and economic. Physically, both devices are the same and can be exchanged against each other. The number of slave-displays in one system is not limited (e.g. bridge, eng.-chambers, mess-room,...). The devices can be operated independent of each other. Of course, use of the slave-display is not required as far as the system's function is concerned. It is only supposed to demonstrate a possibility. Data entry is done menu-guided, via a pluggable keyboard (TYPE PC-Mini 5). Input via PC is presently being developped.

In this example, all sensors have an output voltage of 4-20mA, but it is just as well possible to process voltage signals, e.g. 0(2)-10V, resistors or signals (also non-linear ones).

Measuring value evaluation is done with a resolution of 12 bits. For a sensor-signal of 4-20mA this results in an accuracy of appr. 0.5 %, including consideration of internal tolerances.

The tank content is shown graphically as bar charts and additionally as numeric value above the bars. Units (cm, kg, l, t, ...) and names of the tanks can be arbitrarily chosen by the user. Thus, 8 tanks can be displayed on one page. The other pages can be called up by paging with the + and - keys.

The tanks may have any desired shape. Due to a special software, each tank can be subdivided into up to 26 level segments, i. e. the parameters are entered at the relevant level segments and the program independently linearizes between the individual "slices". The relevant level segment is not predetermined but can be arbitrarily defined according to the user's requirements.

Placing of the tanks on the display
If nothing else is agreed upon, the tanks of inputs 1 to 8 of data station U1 are displayed on page one (T1). They correspond to bars 1 to 8 from left to right. The next 7, i. e. inputs 9 to 15, are displayed on the second page (T2). The space for the 8th bar remains empty. Similarly, data station U2 is displayed on pages 3 (T3) and 4 (T4).

Alarms
For each tank, two arbitrarily programmable limiting values can be predetermined. They are marked graphically. + or - indicate if it is a max. or min. limiting value. When a limiting value is reached, the horn relay activates after the programmed delay time (0 to 999 s). At the same time, the normally activated collective alarm relay releases. In case it had already released, because of one or more upcoming alarms, it activates again for appr. 3s and then releases again (collective alarm repetition)

A flashing cross for an optically unacknowledged alarm and a non-flashing checkmark after it has been optically acknowledged.

ALARM PANEL

ALARM PANEL:	Date	Time	T no
+ Bottom tank 2	02.06	12:45	3
✓ Fuel tank Pt.	01.06	08:25	2

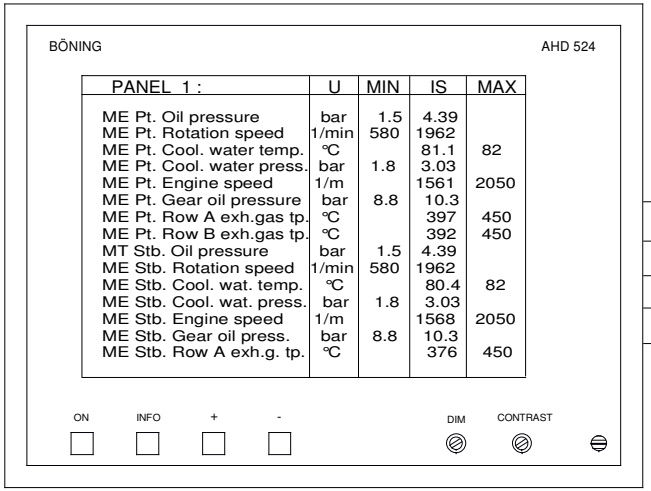
Shift [+] [-] Back [Info] 12 : 47 : 03

Also, an alarm causes the display to automatically switch over to the alarm panel. Here, all actual alarms are indicated including text, date and time in the chronological order of their occurrence. The latest alarm is displayed in the first line, the oldes in the last line. With the INFO-key, the user can backspace and manually call up the alarm panel at any time.

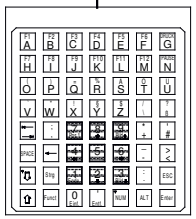
Acknowledgement
The device has one input each for acoustic and optic acknowledgment. After acoustic acknowledgement, the horn relay releases. Optically unacknowledged alarms are indicated by a flashing star on the left side of the measuring point text. After optic acknowledgement, instead of the flashing star, a non-flashing checkmark is shown. Once the alarm criteria is no longer existing, it will be deleted in the alarm panel after elapsing of the programmed switch-off delay time (0 to 999s). This only applies for alarms that have previously been optically acknowledged. The order to first acknowledge acoustically and then optically must be followed.

Options
AHD 903R is a small module with 4 group relays. It can be connected with a data station AHD 903-15. One of the four group relays can be assigned to the limiting values of each of the 15 inputs. The relays can operate as first- or new-value-indicator.

AHD R101 is a relay unit with 15 relays that are led onto terminal blocks over 1 floating two-way contact each. It can be serially connected to a data station AHD 903-15 over only one wire. Thus, it is possible to assign the limiting values of each input of AHD 903-15 to one relay.



5-pole DIN plug-in connection



The analog data station has 15 inputs and can register and evaluate the following sensors and/or signals:

Pt100, Pt1000, 0(4)-20mA, 0(2)-10V, binary signals (customer-specific ones upon request).

For configuration of the data station, the LCD-display AHD 524 with external keyboard is used. There is the possibility, to e.g. assign up to two limiting values to each input. Over a serial output, the information, if and which inputs reached limiting values, are transmitted to the relay station. Here, the inputs 1 to 15 of the data station are assigned to the relays 1 to 15. This means that if, e.g., input 12 reaches a limiting value, relay k12 switches. Thus, 15 measuring transformers that are independendt of eachother can be realized. Switch-on and switch-off delays from 1 to 999s can be configured. Also, each input can be blocked by another input.

Example:
Input 1 is for registration of the lub. oil pressure of a Diesel-engine. 4-20mA input current correspond to 0 to 10 bar. At 1.5 bar pressure, an alarm shall be released by the relay station. Over input 2, the engine speed is entered over a 4-20mA-signal (4-20mA correspond to 0-3000 1/min). Oil pressure monitoring shall only be done once the engine speed is 8s higher or the same as idle run speed.

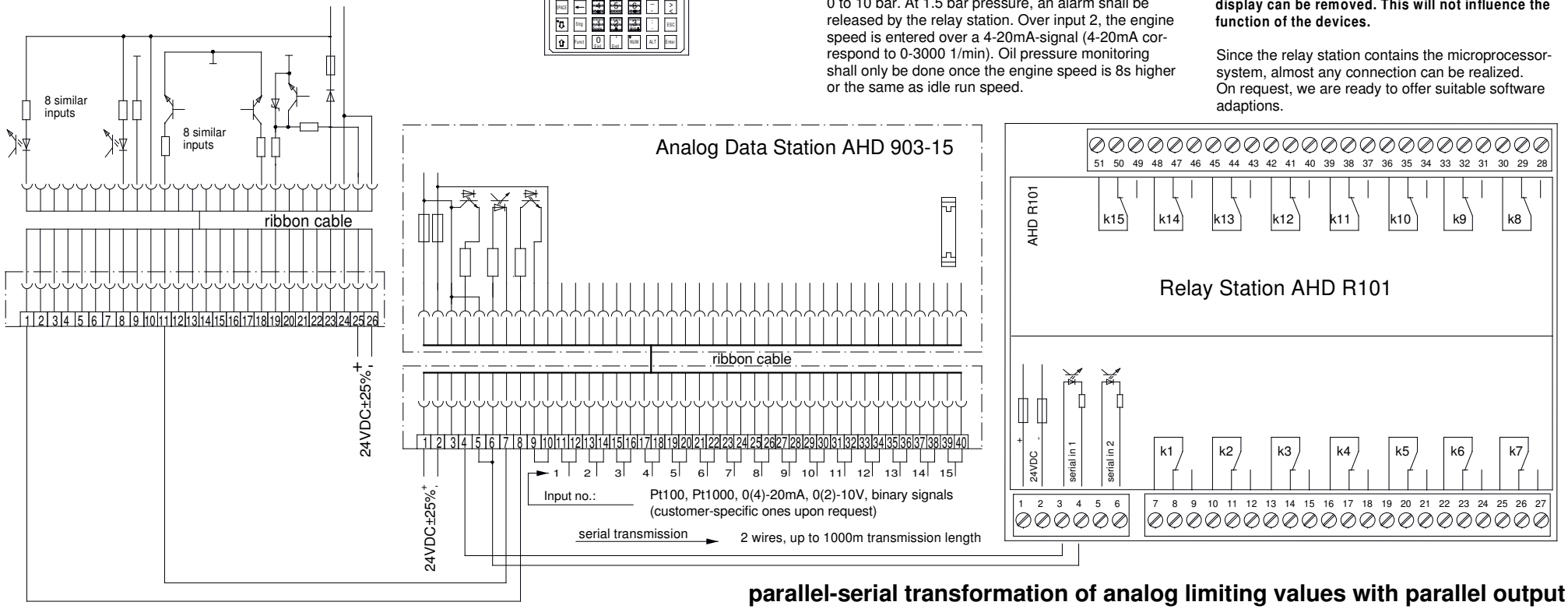
Solution:
With a suitable input-menu, inputs 1 and 2 are configured by the display. A min.-limiting value is assigned to input 1 (1,5bar). A max.-limiting value, that is the same as the idle run speed, is assigned to input 2. Input 1 is blocked by input 2. So as long as the speed limiting value is not reached, the oil pressure will not be monitored. Relay k1 remains dropped. Only 8s after reaching of the idle run speed, relay k2 is activated. In case the oil pressure goes down to 1.5 bar, relay k1 is activated after elapsing of the configured delay time.

Especially for the above mentioned application, there is a software with which the oil pressure can be monitored depending on the rotation speed (please enquire).

The permitted distance between the devices is 1000m. In case of decentralized placing, wiring is reduced from 30 to 2 wires. A floating transfer contact with a permitted load of 250VAC/DC and 3A is available on the side of the receiver.

After configuration of the data station, the LCD-display can be removed. This will not influence the function of the devices.

Since the relay station contains the microprocessor-system, almost any connection can be realized. On request, we are ready to offer suitable software adaptions.



parallel-serial transformation of analog limiting values with parallel output

524-4-e.MCD

Analog Reports

Böning AHD 524

PANEL 2 :	U	MIN	IS	MAX
ME Pt. Oil pressure	bar	1.5	4.39	
ME Pt. Rotation speed	1/min	580	1962	
ME Pt. Cool. water temp.	℃		81.1	82
ME Pt. Cool. water press.	bar	1.8	3.03	
ME Pt. Engine speed	1/m		1561	2050
ME Pt. Gear oil press.	bar	8.8	10.3	
ME Pt. Row A exh.gas tp.	℃		397	450
ME Pt. Row B exh.gas.tp.	℃		392	450
ME Stb. Oil pressure	bar	1.5	4.39	
ME Stb. Rotation speed	1/min	580	1962	
ME Stb. Cool. wat. temp.	℃		80.4	82
ME Stb. Cool. wat. press.	bar	1.8	3.03	
ME Stb. Engine speed	1/m		1568	2050
ME Stb. Gear oil press.	bar	8.8	10.3	
ME Stb. RowAexh.gas.tp.	℃		376	450

ON INFO + - DIM CONTRAST

Alarm Panel

Böning AHD 524

ALARM PANEL:	Date	Time	T no.
☒ Start air block false manoeuvre	07.03.	14:50	-
☑ Failure 24V remote control	07.03.	12:15	-
☑ Lub. oil pressure ME Stb.	07.03.	9:20	2

Shift [+] [-] Backspace [Info] 12 : 47 : 03

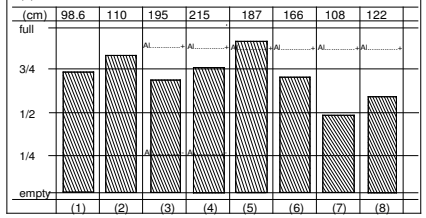
ON INFO + - DIM CONTRAST

Tank Displays

Böning AHD 524

PANEL 3: Tank Content Displays 1

(1) Bottomtank 1
(2) Bottom tank 2
(3) Side tank 1
(4) Side tank 2
(5) Trim tank 1
(6) Trim tank 2
(7) Trim tank 3
(8) Trim tank 4



ON INFO + - DIM CONTRAST

Exhaust Gas Average Value System

Böning AHD 524

PANEL 4 :	U	MIN	IS	MAX
CYLINDER A1	℃	32	462	38
CYLINDER A2	℃	30	460	40
CYLINDER A3	℃	35	465	35
CYLINDER A4	℃	33	463	37
CYLINDER A5	℃	32	462	38
CYLINDER A6	℃	35	465	35
CYLINDER B1	℃	31	461	39
CYLINDER B2	℃	37	467	33
CYLINDER B3	℃	30	460	40
CYLINDER B4	℃	33	463	37
CYLINDER B5	℃	31	461	39
CYLINDER B6	℃	35	465	35
AFTER TURBO A	℃		372	400
AFTER TURBO B	℃		365	400
AVERAGE VALUE		35	463	35
MAX CYLINDER TEMP.				500
BLOCKING RANGE		200		

ON INFO + - DIM CONTRAST

Displays can be called up by paging with the + and - keys or the info-key.

Examples for design of pages (masks)

CHAMBER/MESSROOM PANEL
AHD 406-2

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

1. General

AHD 406-2 is a device for control desk mounting used as chamber and messroom panel within the scope of failure report systems and/or stand-by alarm systems on ships. It receives data via a serial bus from one of the following devices:

- AHD W Data Distributor (Version B)
- AHD 406H Group Alarm Panel with 10 groups
- KOMPAKT EDA 47 Group Alarm Panel with 16 to 48 groups

2. Device assembly

The device is designed for wall installation with an installation depth of only 26mm. It consists of an electronic card and a two-piece front panel containing the text field. The alarm / message LEDs can be dimmed depending on the ambient brightness.

The connections installed by the shipyard are carried out via an 11-pole terminal block mounted on the circuit board.

3. Function

At least one of the devices mentioned under pos. 1 must be part of the alarm system. The device contains all alarms/status messages that can be assigned to one of 15 groups. They are transmitted to the chamber and messroom panel via serial bus, where they are displayed as alarm or message.

Unlike status messages, alarms activate the integrated buzzer and flashing of the corresponding LED in the front panel. The horn relay closes at the same time.

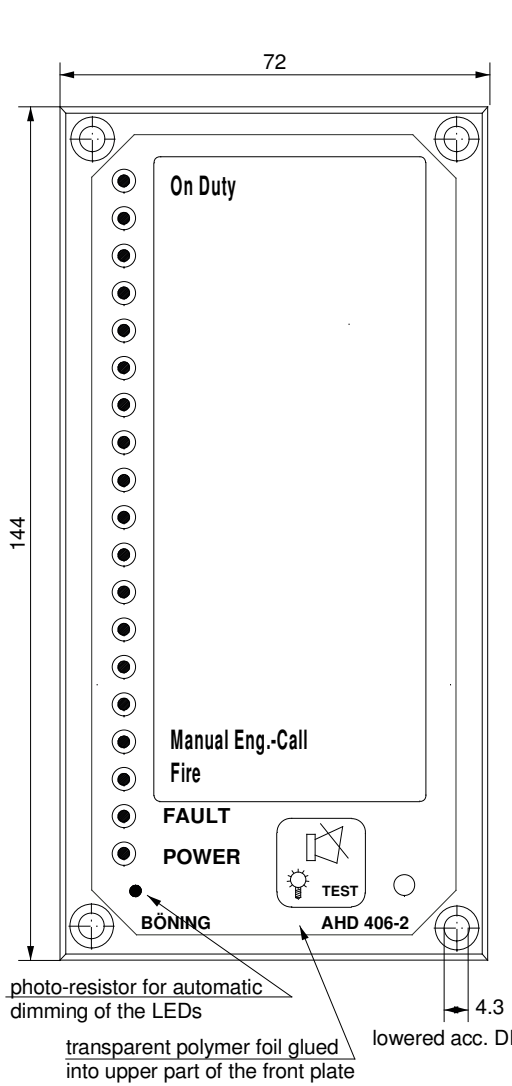
Apart from the serial input, the chamber / messroom panel also has one binary input each for Fire and Engineer call messages. The binary inputs are galvanically separated from each other and the rest of the electronics and operate independently. One buzzer and one LED in the front panel are assigned to each binary input.

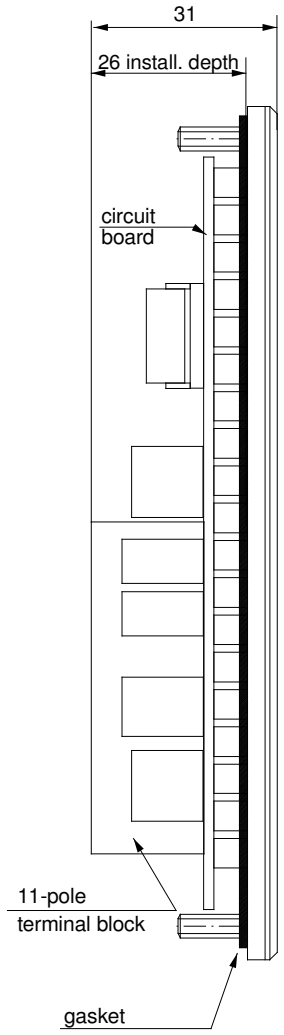
3.1 Acknowledgement

The acoustic alarm (horn) is acknowledged via the button on the front panel, or via serial bus on one of the devices mentioned under pos. 1. Optical alarm acknowledgement is only possible via serial bus. Engineer and Fire calls can neither be acknowledged acoustically nor optically on the device, but on the corresponding alarm trigger.

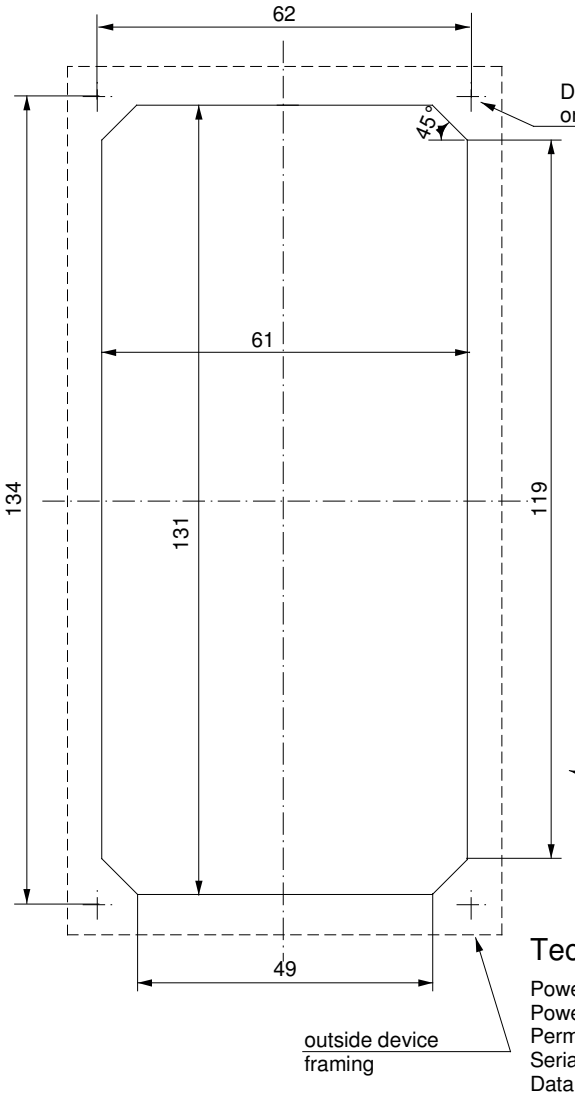
4727maße.mcd

Dimensional Drawing

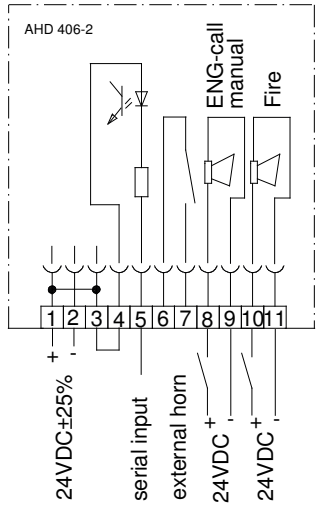




Panel Cut-Out



Terminal Diagram



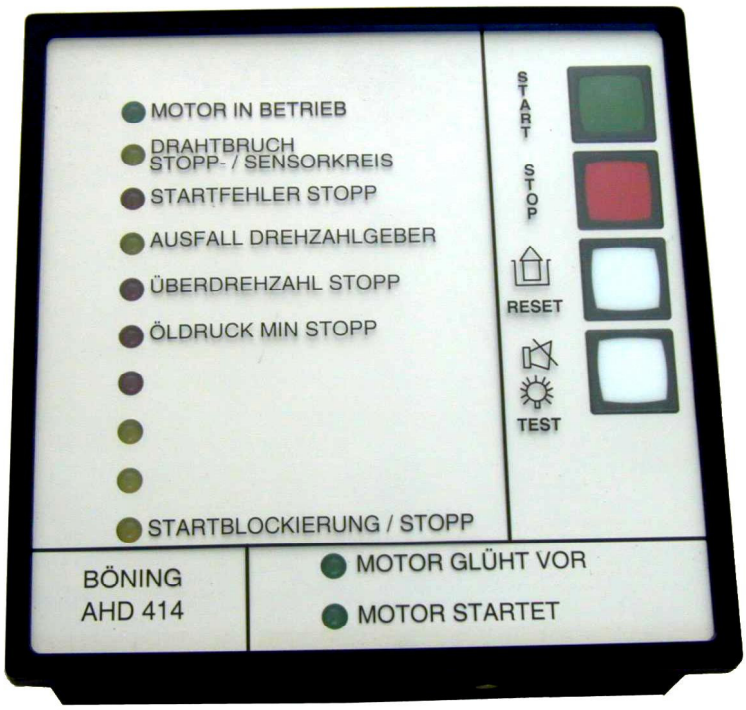
Technical Data

Power supply:	24VDC +/- 25%
Power consumpt. of the electronics:	appr. 0.2A
Perm. charge of relay contacts:	50V/2A
Serial interface:	TTY-current loop
Data transmission rate:	1200 Baud
Weight:	0.5kg
Protection class:	IP 66/67 at front IP 00 at rear side

In order to access the text field, both parts
must be removed from the front plate.

START / STOP DIESEL CONTROL UNIT

AHD 414



AHD 414 is a microprocessor controlled start/stop diesel engine control and monitoring device for control desk mounting. It is available in several versions, depending on the individual engine manufacturing series.

- device for control desk mounting
- integrated programmable firing speed and overspeed monitoring (frequency dependent)
- individual problem solutions possible
- small and robust design
- high load capacity of the relay outputs
- low power consumption (app. 0.15A)
- designed for high power supply fluctuations
- 22 pole plug terminal block
- serial bidirectional interface
- available with add-on front cover, locking with sliding bolt or lock
- approved by: GL (other classification organisations on request)

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

CONTENTS

	PAGE
1. General	3
2. Assembly	3
3. Main functions	3
3.1 Engine startup	3
3.2 Stopping the engine	4
3.3 Alarm acknowledgement	4
3.4 Resetting	4
4. Programming	4
5. Wire break stop circuits/sensor circuits	4
6. Remote control	5
Order related technical specification page 1	6
Order related technical specification page 2	7
Order related technical specification page 3	8
Order related technical specification page 4	9

Start Stop Diesel Control Unit

1. General

AHD 414 is a microprocessor controlled device. The original version was designed for starting, stopping and monitoring of diesel engines. The device can be adjusted to different requirements with several software variations that can be called up by the user.

Its features are:

- device for switchboard mounting
- integrated firing and overspeed monitoring (frequency dependent)
- optional individual problem solutions
- small and robust construction
- relay outputs with high load capacity
- low power consumption (0.15 A app.)
- designed for high power supply fluctuations
- approved by: Germanischer Lloyd

2. Assembly

AHD 414 consists of an electronic card with a processor system and all necessary periphery components. The card is fixed to a front cover consisting of AlMg1 with 4 spacer bolts. All ICs are plugged into mounting sockets. The programme is stored either in an EPROM 27C256 or 28C256. All inputs and outputs lead to a pluggable 22-pole terminal block. The card contains a bi-directional serial interface (TTY). Labeling is possible by the following methods:

- silk-screen printing of the front panel by anodizing
- printed foil is inserted between front frame and front panel

The unit is accommodated in a housing corresponding to DIN 43700 for control desk mounting with a front frame (dimensions: 144mm x 144mm) and an installation depth of 53mm. The device can be equipped with a front cap with turnbuckle or lock if required.

3. Main functions

3.1 Engine startup

The engine can be started directly on the AHD 414 or by means of a second device, acting as a remote control where none of the following criteria apply:

- start blocking input is active
- stop alarm is activated
- engine already on
- operating switch on motor activated (if available)
- lubricant oil pressure is not low

Depending on the instructions of the attached order related technical specification, the engine has to pre-glow or start immediately. The pre-glowing time can be programmed arbitrarily. The starting process is finished once the programmed frequency is emitted by the tacho-generator. The duration of a single start trial as well as the number of start trials are also programmable.

Prior to switching on the starter, the program checks whether the oil pressure is low or the tacho-generator picks up a signal. Where at least one of the aforementioned criteria applies, the starter is not activated, instead the automatic supervision is switched on. The starter is thus optimally protected. The parameters do not lead to a break-off of the actual start process but prevent its initiation.

3.2 Stopping the engine

The engine can be stopped manually on the AHD 414, externally by a remote stop or by a stop alarm., A solenoid or operating magnet can be used as possible stop actuator (programmable).

3.3 Alarm acknowledgement

The lower button on the device has the function of acknowledging horn and optics as well as performing a lamp test.

3.4 Resetting

The reset button on the device resets acknowledged alarms to their original state. It can moreover interrupt an active stop signal.

4. Programming

This description includes an ORDER-RELATED TECHNICAL SPECIFICATION that is the basis for our production. It is filled out by the customer according to his specific requirements. Where a programming device is available (e.g. the battery operated S4 that can be supplied by Böning) the user can quickly modify the parameters that may be of importance during commissioning.

The following parameters are programmable:

- pre-glowing time
- number and duration of start trials
- frequency of firing speed and overspeed
- solenoid or operating magnet
- stop time
- delay times
- inputs (NC or NO)
- wire break monitoring of the inputs
- inputs (display or alarm)
- suppression of alarms, depending on kind of operation (e. g. oil pressure)
- inputs 7, 8 and/or 9 can be used as power switch input e.g. for release of oil pressure alarms.

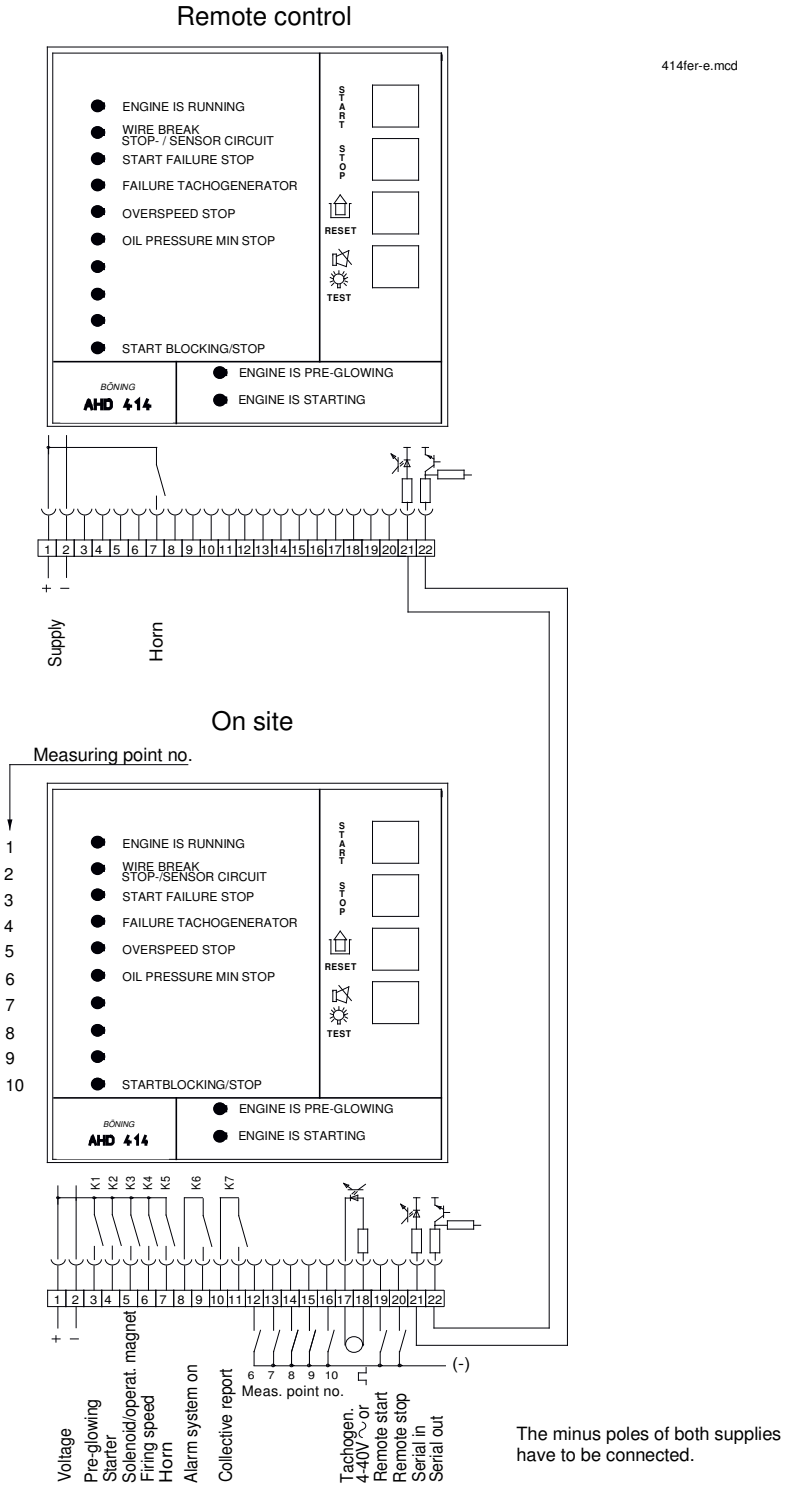
The programme furthermore includes a variety of special functions (starting on page 2 of the ORDER-RELATED TECHNICAL SPECIFICATIONS) that can be easily activated by the user entering storage addresses. The possibilities are continuously extended according to customer requirements. Thus, it is possible to assign different functions to relays (e.g. auto-stop, engine ready for start...), which are not needed in the basic version (e.g. horn, pre-glowing...).

5. Wire break stop circuits/sensor circuits

There is a permanent low test current on the stop output. The alarm „wire break stop circuit/sensor circuit“ is released where this current is interrupted. Should only this LED flash, the stop circuit is interrupted. If a sensor wire is interrupted, the above-mentioned LED as well as the corresponding sensor LED flash. Z-diodes BZX 5V6 are used for wire break monitoring of the binary alarm inputs where cyclic voltage of less than 5.6V (alarm mode) and of more than 5.6V (wire break mode) is switched. The wire break supervision is thus also used as internal system check since the inputs must switch in the same cycle. If a Z-diode is reversely connected it functions as a closed contact.

6. Remote control

AHD 414 bi-directional serial interface (TTY) enables communication with other data stations. It is possible to use a second device as a remote control.



Start Stop Diesel Control Unit

Measuring point no.	DELAY		STOP		INPUT NC/NO (idle/operat.)		DISPLAY/ ALARM		Suppression by meas. pt. 1		Wire break supervision		Operating switch function		Manual emerg. stop input		LED COLOR
	EPROM address	Content (1/4sec)	EPROM address	yes = 01 no = 00	EPROM address	NO=01 NC=00	EPROM address	Display=01 Alarm=00	EPROM address	yes = 01 no = 00	EPROM address	yes = 01 no = 00	EPROM address	yes = 01 no = 00	EPROM address	yes = 01 no = 00	
1	3F70		_	_	_	_	_	_	_	_	_	_	_	_	_	_	green
2	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	_	yellow
3	_	_	3F82	01	_	_	_	_	_	_	_	_	_	_	_	_	red
4	_	_	_	no	_	_	_	_	_	_	_	_	_	_	_	_	yellow
5	_	_	_		_	_	_	_	_	_	_	_	_	_	_	_	red
6	3F75		3F85		3F95		3FA5		3FB5		3FC5		_	_	_	_	red
7	3F76		3F86		3F96		3FA6		3FB6		3FC6		3FE6		_	_	red
8	3F77		3F87		3F97		3FA7		3FB7		3FC7		3FE7		4600		yellow
9	3F78		3F88		3F98		3FA8		3FB8		3FC8		3FE8		4601		yellow
10	_	_	_	_	3F99		_	_	_	_	_	_	_	_			yellow

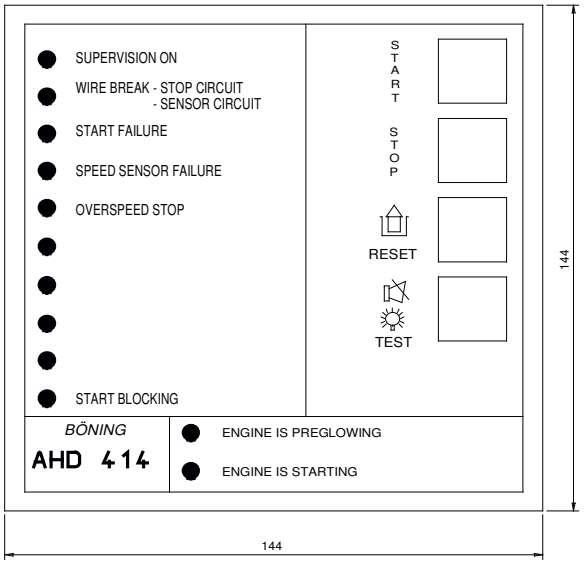
ENTERING INTO THE EPROM ADDRESSES MUST BE DONE DECIMALLY AND TWO-DIGIT.
EMPTY EPROM ADDRESSES HAVE THE CONTENT "00".

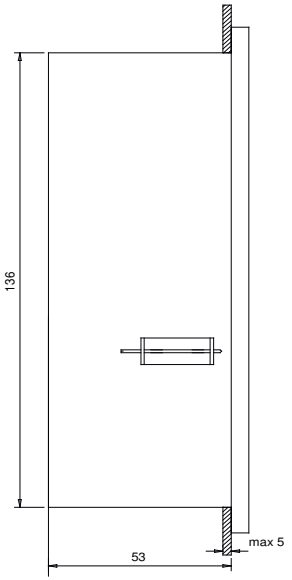
Preglowing time : min 3 Fd0 sec 3 Fd1
Number of start trials : 3 Fd2
Duration of one start trial : sec 3 Fd3
Frequency of the speed sensor at termination of starting procedure : Hz 3 Fd4 (high) 3 Fd5 (low) ← min 0008 Hz, max 9999 Hz
Frequency of the speed sensor at overspeed : Hz 3 Fd8 (high) 3 Fd9 (low) ← min 0008 Hz, max 9999 Hz
Stop time : sec 3 FdA

Solenoid (content 00) Operating magnet (content 01) : 3 FdB

Overspeed function : 2E99 ← yes cont. C0, no cont. C9

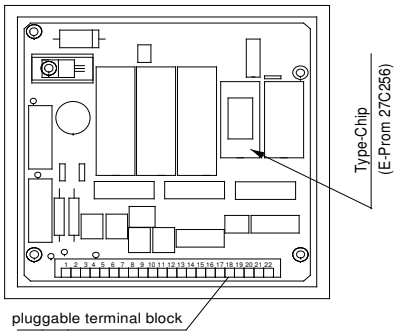
Measuring point text



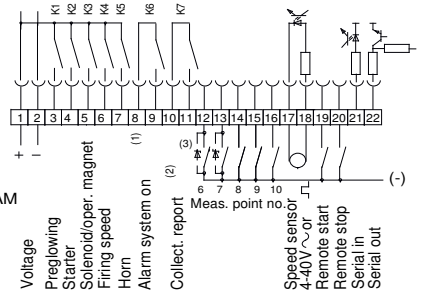


Attention: If the input start blocking is used, it must be ensured for safety reasons that the starter circuit is interrupted while this input is active.

Rear view without cover



STANDARD - TERMINAL DIAGRAM



(1) Contact closes after switching on of the device. It opens appr. 5 s after starting of the engine in order to "arm" an eventually existing alarm system.

(2) Contact closes after switching on of the device. It opens in the event of an alarm. It closes for appr. 2 s, if another alarm is released and then opens again (collective alarm repetition).

(3) For wire break supervision of the stop alarm circuits, Z-Dioden BZX5V6/1.3W (part of delivery) are installed parallel to the contacts.
(only for 24V power supply)
Symbol: 
View:

TECHNICAL DATA

Power supply	: 24VDC ± 25% or 12VDC
Power consumpt. of electronics	: appr. 0.15 A
Perm. load of relay contacts	: starter- and solenoid/ operating magnet circuit - 20 A peek current - 10 A cont. current - all other relays 2 A
Prem. rel. air humidity	: 99%
Panel cut-out	: 138 mm x 138 mm
Protection class	: with front cap IP 54
Installation depth	: 53 mm
Weight	: 0.5 Kg

PAGE 1 OUT OF 4 PAGES

ORDER-RELATED TECHNICAL SPECIFICATION
(basic function, event. addit. functions, starting on page 2)

Relay	Address	Content	Function
K1	3FE0	00	Pre-glowing
		01	Engine stopped automatically
		02	Overspeed
		03	Relay changes at each start trial
		04	Relay switches the lub.oil-pump for 20 min. after stop
K2	3FE1	00	Starter
		01	Engine stopped automatically
		02	
		03	
		04	
K3	3FDB	00	Solenoid
		01	Operating magnet
		02	
		03	
		04	
K4	3FE3	00	Firing speed
		01	
		02	
		03	
		04	
K5	3FE4	00	Horn
		01	Engine ready for start
		02	Engine not ready for start
		03	Start failure
		04	

Relay	Address	Content	Function
K6	3FE5	00	Alarm system on alert
		01	Engine stops
		02	Switches on with operating magnet and drops again after 2 seconds
		03	Switches on with starter and drops 2 seconds after start trial
		04	K6 ON at auto-stop
		05	K6 OFF at auto-stop
K7	3FE6	00	Collective alarm
		01	If supervision is activated, switching can be done for 2 sec. via input 10 (terminal 16) K7.
		02	
		03	
		04	

Empty storage-addresses have the content "00".

SPECIAL FUNCTIONS

Empty storage addresses have the content "00".

Eprom-address

yes = 01
no = 00

3FDC	

relative stop time:
Engine stops until speed = zero plus the time that was entered into address 3FDA (see page 1).

yes = 01
no = 00

3FEA	

Afterglow:
After starting of the engine it will be afterglowed for appr. 10s.

3FEB	

00 = Engine can be started independently of the oilpressure.
01 = Engine can only be started, if oil pressure lower than P-oil-pressure-switch (additional starter protection).
02 = Engine can only be started at existing oil pressure (preglow relay switches pre-lub. pump).

7EA0	

00 = Alarm speed sensor failure, if SUPERVISION ON and frequency signal failure.
01 = Alarm same as at contentn 00 and additionally failure terminal D+, (input 9, loading control)

3FFE	

00 = Switch-off procedure is terminated after elapsing of time entered into address 3FDA (see page 1).
01 = No time limit for stop signal; cancelling of stop signal by "Starting of Engine", or, at auto stop, please acknowledge and reset first.
02 = No time limit for stop signal; cancelling of stop signal by reset, or, at auto stop, please acknowledge first.

3FFF	

00 = Wire break in stop circuit is monitored.
01 = No wire break monitoring in stop circuit.

3FDF	

01 = Reset after auto stop only possible after engine has completely stalled (speed frequency smaller than 7 Hz).

3FFA	

00 = Terminal 16 start blocking
01 = Terminal 16 for conditional preglowing, e.g. thermostat (only if this input is active)

Battery plus — Shutter — 21

3FFB	

00 = Normal
01 = Input 9 becomes remote start input (can also be monitored for wire break).

3FFD	

00 = Normal
01 = K1 switches for 5s, if it has the function "auto stop" or "overspeed".

4602	

00 = Engine speed is registered as frequency signal
01 = Engine is running is registered as voltage signal.

Battery minus — 17
Battery plus or D+ from alternator — 18

4603	

00 = Engine is running if there is a voltage (10 to 35 VDC) at terminal 18.
01 = Engine is running if there is no voltage at terminal 18.

7EE0	

00 = Normal
01 = If serial input is charged with 24V, this works as overspeed-test. (overspeed switching point drops appr. 17%)

ORDER-RELATED TECHNICAL SPECIFICATION (SPECIAL FUNCTIONS)

Empty storage addresses have the content "00".

Serial communication : | 3FDE | |

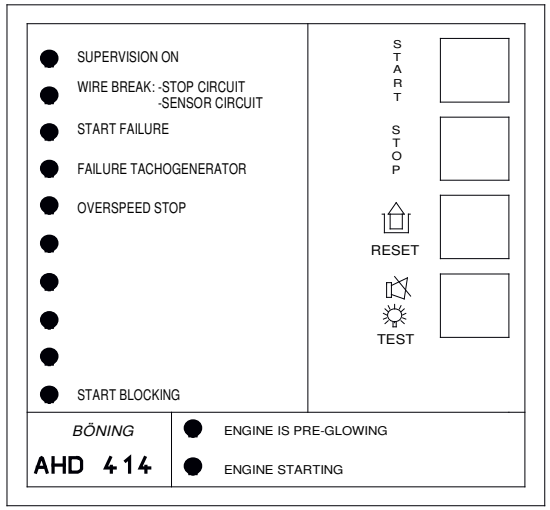
00 = No serial communication.
01 = AHD 414 is connected as remote control.
02 = PS 47- 1- 15 (binary data station) is connected as input station.
03 = Serial input over data station PS 47-1-15 and serial output to data distributor AHD W.
05 = On parallel display AHD 406-2
06 = Serial output on data distributor AHD W (see below).

Serial output to data distributor AHD W

In this output format, AHD 414 works like a data station PS47-1-15. The following protocol shows the bit-order:
Format: Startbit (high), 15 data bits according to the below mentioned order (high-bit, if report is active), 20 to 100 bits low,
1200 Baud, are transmitted between the data protocols. Thus, the bits can be programmed arbitrarily and be transferred to the alarm systems KOMPAKT EDA 47.

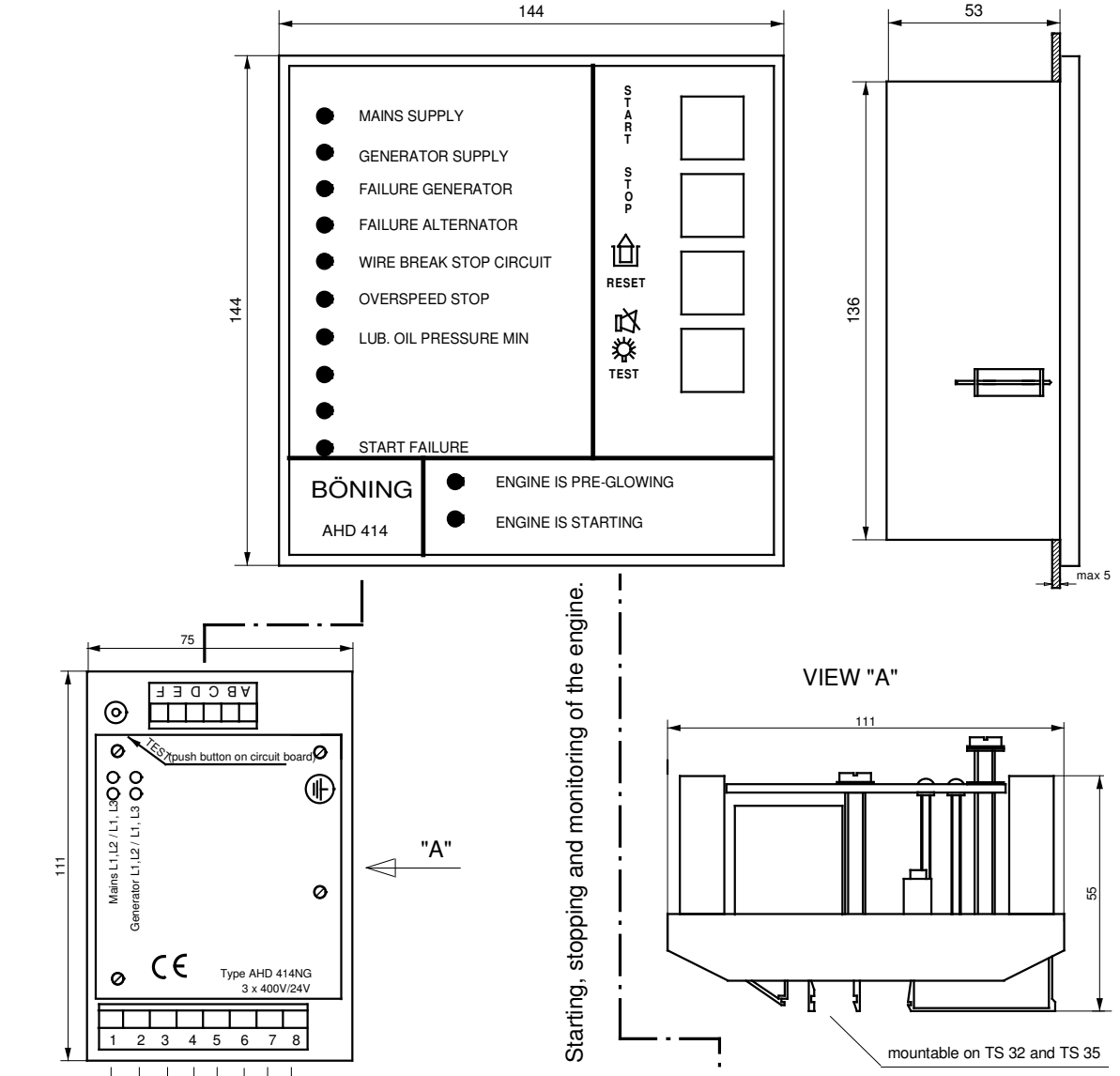
Output protocol if content of Eprom address 3FDE is 06

	Meas.point no.
1. Wire break	1
2. Firing speed	2
3. Alarm blocking cancelled (Meas. point no. 1)	3
4. Collective alarm	4
5. Manual stop	5
6. Engine ready for start	6
7. Automatic stop	7
8. Start program is running	8
9. Meas. point no. 9	9
10. Meas. point no. 8	10
11. Meas. point no. 7	
12. Meas. point no. 6	
13. Start failure	
14. Failure tachogenerator	
15. Overspeed	



		ORDER-RELATED TECHNICAL SPECIFICTION (SPECIAL FUNCTIONS)
	PAGE 4 OUT OF 4 PAGES	

Emergency power control device AHD 414
with
mains power and generator power registration device



-monitoring of mains and generator power
-monitoring of engine
-automatic starting in case of power failure
-switching off of mains contactor and switching on of generator contactor
-automatic switching back to mains operation after restoration of power
-automatic stopping of the engine after termination of servo time
-test function
-critical function

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

CONTENTS

		PAGE
1.	Function	3
2.	Assembly AHD 414	3
3.	Assembly AHD 414NG	4
4.	Function	4
4.1	General function	4
4.2	Engine startup	5
4.3	Stopping the engine	5
4.4	Test operation	
4.5	Critical operation	5
4.6	Alarm	5
4.7	Alarm acknowledgement, lamp test	6
4.8	Resetting	6
4.9	Wire break in the stop circuit	6
5.	Programming	6
Terminal diagram		7
Dimensional drawing for emergency power unit AHD 414		8
Technical data for emergency power unit AHD 414		8
Dimensional drawing for mains and generator power control unit AHD 414NG		9
Technical data for mains and generator power control unit AHD 414NG		9
Type-code		9
Device specifications		10

Emergency power control device AHD 414
with
mains power and generator power registration device

1. Functions

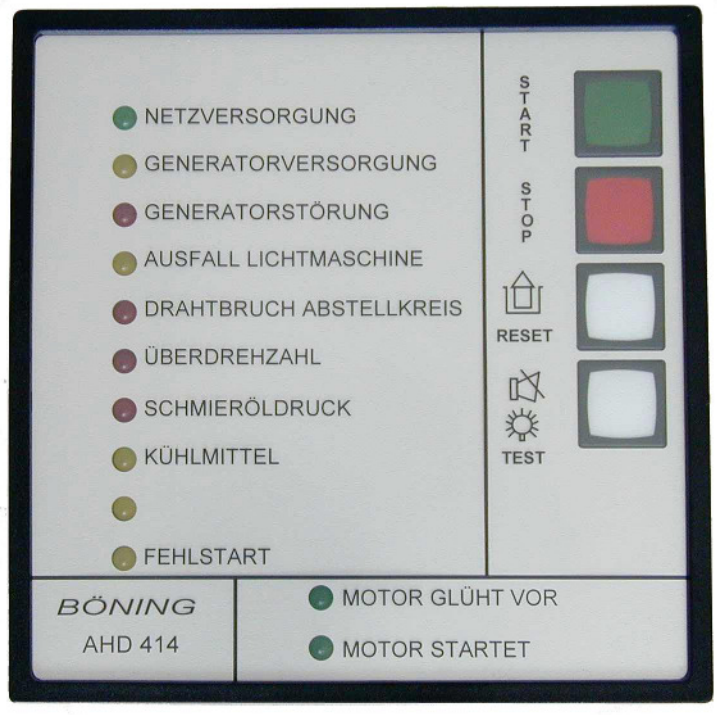
The system has the following functions:

- monitoring of mains power and generator power
- monitoring of the generator engine
- automatic start in case of power failure
- switching off mains contactor and switching on generator contactor
- switching back to mains operation after main power recovery
- stopping the generator engine after lapse of turn-off delay
- test function
- critical operation

2. Assembly AHD 414

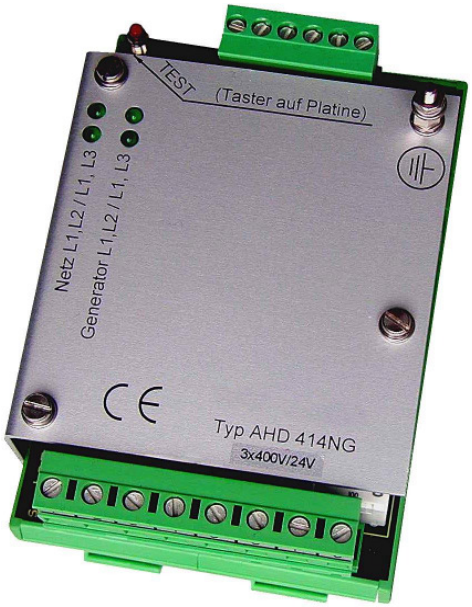
AHD 414 consists of an electronic card with a processor system. The card is fixed to a front panel with four distance bolts made of AlMg3. All ICs are plugged into sockets. The programme is stored in an Eprom 27C256. The inputs and outputs are led to a 22-pole pluggable terminal block. A printed foil between the front frame and the panel functions as labelling. Special editions such as waterproof front panels are possible.

The unit is encased in a housing for control desk installation acc. to DIN 43700. Its front frame dimensions are 144mm x 144mm and its installation depth is 53mm. The device can be equipped with a front cap with turnbuckle or lock if required.



3. AHD 414NG assembly

AHD 414NG consists of an electronic card inserted into a housing for mounting on rail TS 32 or 35. The device has a 6-pole and an 8-pole pluggable terminal block. An aluminium cover with LEDs for indication of mains power and generator power protects the device. The electronic card also has auxiliary relays for switching the mains and generator contactors.



4. Function

4.1 General function

Unit AHD 414NG measures all phases of the mains and generator power. The relay configuration of AHD 414NG is designed for the mains contactor to be switched on and the generator contactor to be switched off during stand-by mode. This also applies in the case of low battery power or control device failure.

In the event of mains failure the generator engine is started after elapsing of time t1 and the mains contactor is switched off. If at least one phase has a voltage of app. 85% or less of the rated power, this is treated as mains failure. The default setting of the programmable time t1 is usually 2s. Where the engine does not start, three start attempts are effected, followed by the release of a start failure report. The frequency of the tachogenerator (in case of alternators via terminal W) as well as the generator voltage, serve as feedback for the rotation speed and terminate the start process. Voltage (e.g. terminal D+ of the alternator) can also be used instead of the frequency. In this case, no overspeed monitoring is possible since the necessary information is obtained from the frequency of the tachogenerator. Once the generator supplies power, the generator contactor is switched on after the elapse of the programmable time t2 whose default setting is also 2s. Switching to generator supply is indicated optically by a flashing LED. The horn relay simultaneously switches and an external buzzer can thus be activated.

After main power recovery and the elapse of time t3 the generator contactor is switched off and the mains generator is switched on again. The generator engine now runs for time t4 and is then stopped. Times t3 and t4 can also be programmed. In case of another mains failure during this delay time the generator is switched on immediately.

Mains and generator power are indicated on the power registration unit AHD 414NG by LEDs.

4.2 Starting the engine

The engine can either be started manually by pushbutton in the front panel or externally by remote start. Should the generator fail to provide sufficient power, the device restarts it automatically (see section 4.1). Default starting duration is 6s but can be adapted on request. Should the engine not start three start trials are carried out before a start failure report is released.

The engine start trial is terminated in the following cases:

- the tachogenerator frequency for termination of the start process is reached.
- DC voltage is switched to the rotation speed input
- the engine driven generator provides a voltage of at least 85% of the rated power
- start failure after three start trials
- manual stop

AHD 414NG requires two signals to determine the engine's operation: Rotation speed and generator voltage. The start process is interrupted should one of these signals be missing. The 4th measuring point (failure tachogenerator) indicates an alarm.

4.3 Stopping the engine

The engine is stopped either automatically via a stop alarm, manually on the device or externally via remote stop.

The unit is suitable for engines with stop solenoid as well as engines with operating solenoid (programmable).

4.4 Test operation

The device has the following test functions:

a) The pushbutton „Test" in the power control unit AHD 414NG is pushed, simulating the failure of one phase. Here, the device switches to generator operation after obtaining generator power and elapsing of time t2.

b) The engine can be started manually through the start button on the front panel or via remote start. During starting procedure the mains supply is upheld even when there is generator power. Should there be no generator power the alarm „Generator Failure" is released. The generator is activated automatically in the event of mains failure during test operation.

4.5 Critical operation

In some cases of mains power failure, emergency generator power supply must be kept as short as possible. Here, function b) in section „Test operation" is suitable. The engine simply has to be operated in stand-by mode during the critical period to be able to immediately switch to emergency generator power in case of mains failure. When mains power has been restored and the time t3 has elapsed, the system switches back to mains function without the engine automatically stopping but operating in stand-by mode. This function is cancelled only after manual stop.

4.6 Alarms

Alarms are indicated by a relay switched horn and by flashing of the relevant LED on the front panel. Stop alarms result in the stopping of the engine.

4.7 Acknowledgement, lamp test

The lower push button on the device has the function of acknowledging acoustic and optical alarms, as well as lamp test.

4.8 Reset

The reset button on the device resets acknowledged alarms into their basic state. An active stop signal can also be interrupted. This also applies to the GENERATOR FAILURE alarm that is activated in the event of mains failure when the generator has to be activated. After acoustic and optical acknowledgement of this alarm and after reestablishment of mains power, this alarm is cancelled automatically without RESET.

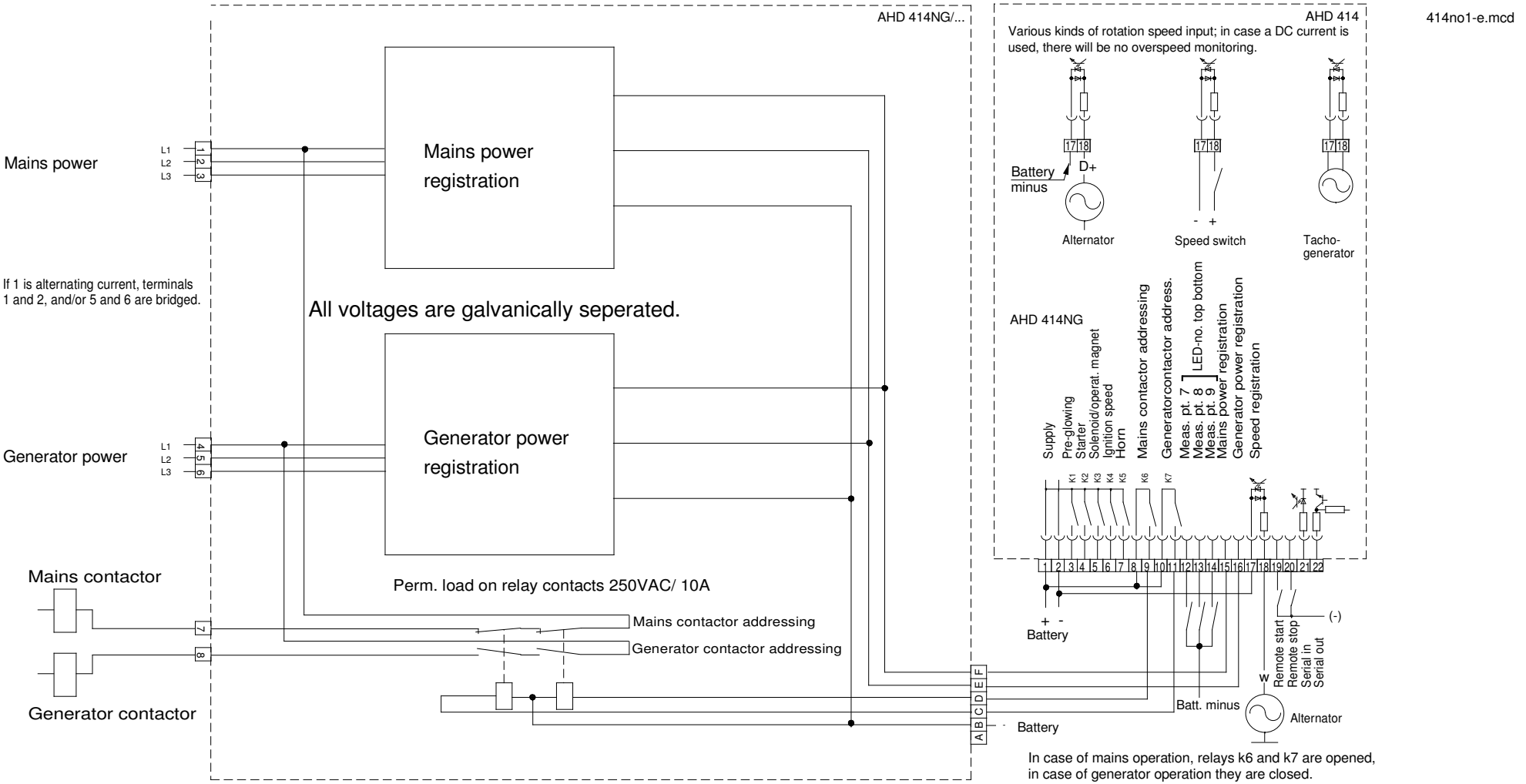
4.9 Wire break in the stop circuit

A test current of approx. 5mA permanently flows through the solenoid coil or operating magnet, even when these are switched off. In the event of failure of this test current, the alarm „WIRE BREAKAGE IN STOP CIRCUIT“ is released. An operating magnet is thus always monitored, even when the engine is switched off and the solenoid is monitored insofar as there is no active stop command.

5. Programming

AHD 414 has an Eprom type 27C256 located on the circuit board in an IC-socket. It stores the system program and data for the relevant application. Equipment specification tables are found on the last page of this manual. Where the device is to be delivered programmed and labelled, these tables are the basis for respective orders and need to be filled out by the customer. The relevant Eprom addresses are provided for all adjustable functions that can be changed by the customer according to his needs. A basic programming device is required for this.

The rear of the housing has to be removed for access to the Eprom.



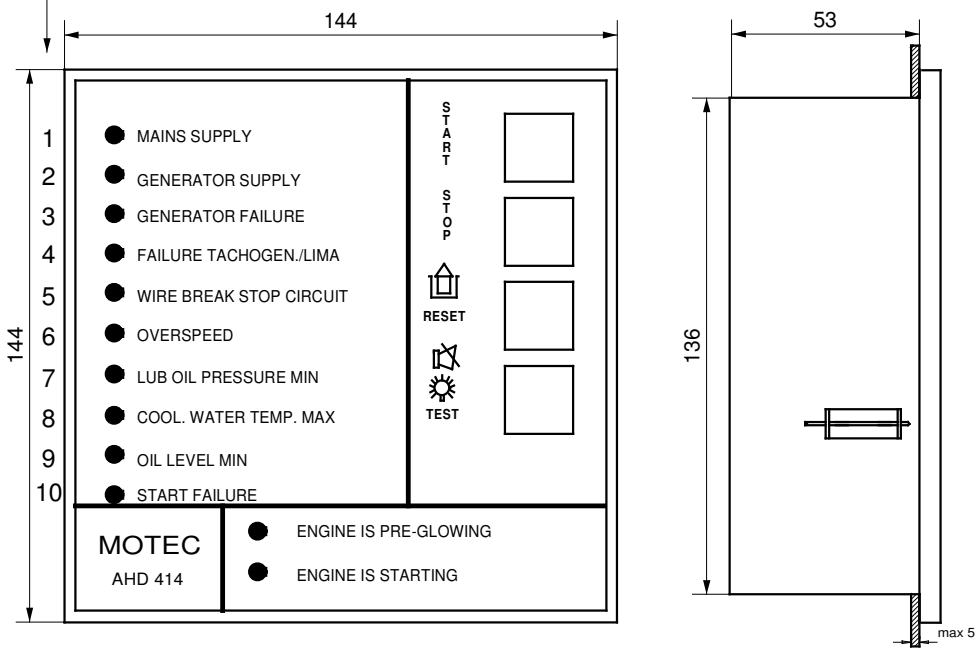
The starting process of the engine is terminated when:
- the frequency of the tachogenerator for termination of the starting process is reached.
- a DC current is led onto the tachogenerator input.
- the generator that is driven by the engine emits a voltage of at least 85% of its rated current.

Perm. load on relay contacts : Starter- and solenoid-/operating magnet circuit
- 20 A start voltage
- 10 A perm. voltage
- all other relays 2 A

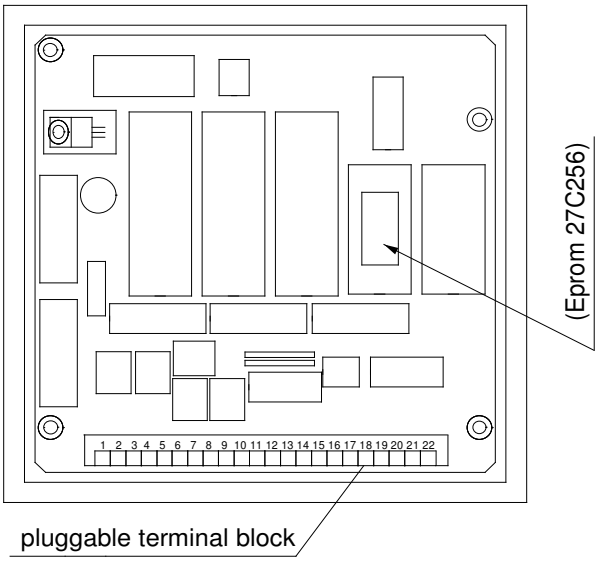
	414no1-e	Emergency power system AHD 414/ 414NG Terminal diagram

Meas. point no.:

DIMENSIONAL DRAWING EMERGENCY POWER UNIT AHD 414



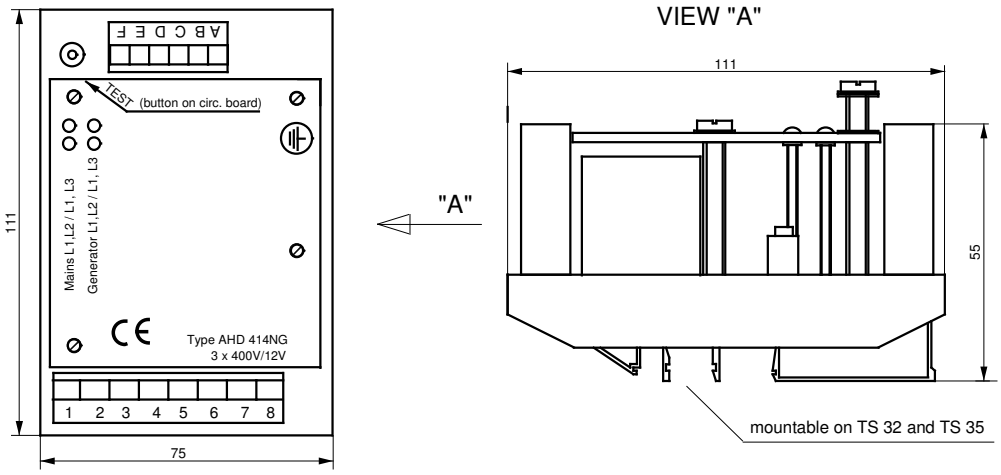
Rear view without cover



TECHNICAL DATA EMERGENCY POWER UNIT AHD 414

Battery supply	: 24VDC or 12VDC, ± 25%
Power cons. of the electronics	: app. 0,15 A
Perm. load of relay contacts	: starter-, solenoid- and operating magnet circuit - 20 A starting current - 10 A perm. current - all other relays 2 A
Connection	: 22-pole plugable terminal block
Permitted rel. air humidity	: 99%
Panel cut-out	: 138 mm x 138 mm
Protection class at front	: with front-cap IP 54
Installation depth	: 53 mm
Permitted ambient temperature	: 0 to 70°C
Weight	: app. 0,5 Kg

DIMENSIONAL DRAWING
MAINS AND GENERATOR POWER MONITORING SYSTEM AHD 414NG ...



TECHNICAL DATA MAINS AND GENERATOR
POWER MONITORING SYSTEM AHD 414NG ...

Battery supply	: 24VDC or 12VDC, ± 25%
Power cons. of the electronics	: app. 0.05 A
Perm. load of relay contacts	: 250VAC/2A
Connection	: pluggable terminal blocks, 1 x 8-pole and 1 x 6-pole
Perm. ambient temperature	: 0 to 70°C
Weight	: app. 0.2Kg

TYPE DESIGNATIONS

AHD 414NG / 110V/12V	: 1 AC current, rated=110VAC, battery=12V
AHD 414NG / 230V/12V	: 1 AC current, rated=230VAC, battery=12V
AHD 414NG / 3 x 400V/12V	: 3 AC current, rated=400VAC, battery=12V
AHD 414NG / 110V/24V	: 1 AC current, rated=110VAC, battery=24V
AHD 414NG / 230V/24V	: 1 AC current, rated=230VAC, battery=24V
AHD 414NG / 3 x 400V/24V	: 3 AC current, rated=400VAC, battery=24V

rated = mains- or generator voltage, battery = battery voltage

Engine		Mains/generator supply	VAC
Nominal speed	1/min	3-phase current	
Battery voltage	VDC	1-phase alternating current	

Details do not apply, if constant speed signal e.g. terminal D is used. +

FUNCTION	Eprom-address	Content	Effect	Content	Effect	Content	Effect	Content	Effect	Content	Effect	Content	Effect	Content	Effect	Content	Effect	Content	Effect	Content	Effect
Time from power failure until engine start (t1) →	300B	00	2s	05	5s	10	10s	20	20s	30	30s	40	35s	60	55s	90	80s	C0	105s	FF	140s
Time from gen. voltage available until gen. contactor on (t2) →	16F6	00	0s	02	1s	05	2s	0A	4s	10	6s										
Time from rest. of power until switch over to mains supply (t3) →	1746	01	0s	05	3s	08	4s	10	8s	20	17s	40	35s	60	45s	90	75s	C0	105s	FF	160s
After-run time of engine (t4) →	1730	00	0.2 min	02	0.5min	05	1 min	08	1.5 min	0C	2 min	12	3 min	1F	5 min	2B	7 min	3E	10 min	5E	15 min
Pre-glowing time →	243A	02	0s	03	7s	04	15s	05	20s	06	30s	08	45s	0B	1 min	13	2 min	1C	3 min	2B	5 min
Frequency of speed sensor until termination of start procedure →	1881	FF	25 Hz	82	50 Hz	55	80 Hz	38	120Hz	26	180Hz	17	300Hz	09	500Hz	08	830 Hz	07	900 Hz	05	1300 Hz
Frequency of speed sensor at overspeed →	1888	B0	58 Hz	91	69 Hz	7F	77 Hz	7C	87 Hz	3D	180Hz	25	300Hz	10	700 Hz	0B	1050Hz	07	1730 Hz	06	2100Hz
Stop time →	1877	03	5s	06	10s	09	15s	0B	20s	0F	25s	12	30s	15	35s	18	40s	1B	45s	1E	50s

Solenoid → Eprom address 3FDB Content 00 ☐

Operating magnet → Eprom address 3FDB Content 01 ☐

Meas. point →

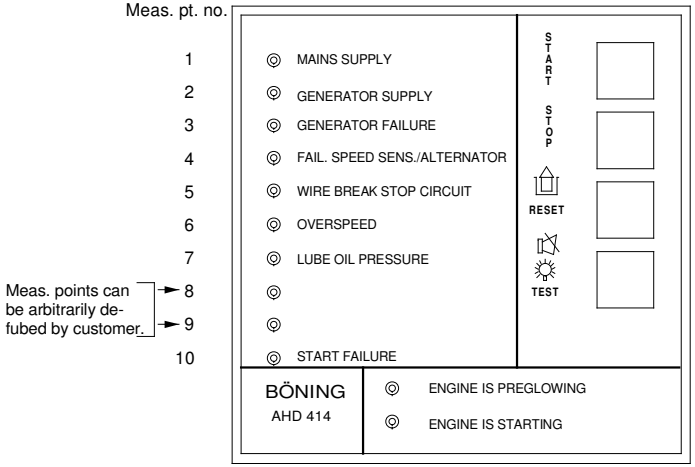
	6789	6789	6789	6789	6789	6789	6789	6789
NO contact Content of Eprom address 1870	D9	F9	59	79	EB	E9	6B	69
No alarm, if motor is idle Content of Eprom address 1E83	D9	59	C9	49				

Meas. point 7 (lub. oil pressure) is always suppressed at idle engine.

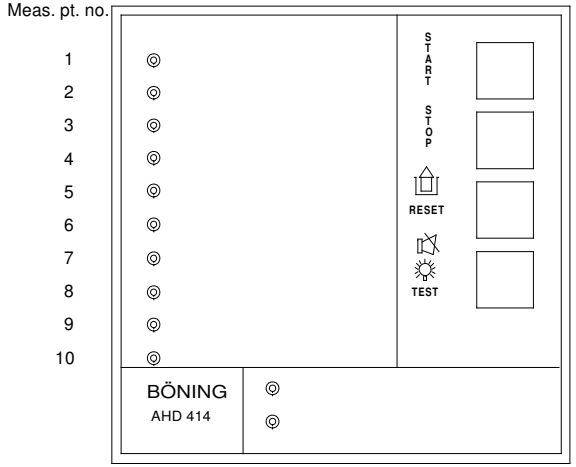
Amount of start trials: 3
Duration of one start trial: 6s
Pause between start trials: 6s

	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789	6789
Stop alarm Content of Eprom address 187A	00	01	02	03	80	81	82	83	31	11	12	13	90	91	92	93

← Meas. point



Meas. points can be arbitrarily defined by customer.



	414notme	Emergency Power Automatic AHD 414/414NG Device Specification

Standby pump and compressor control
AHD 408 series

AHD 408 E

- Microprocessor controlled device for flush mounting.
- Controls two independent pairs of electrical pumps.
- Selector switches for main pumps and standby pumps are installed on the front panel.
- After power-on, the standby pumps build up pressure. Then the system switches over to the main pumps.
- In the event of loss of pressure, the standby pumps start automatically, triggering an alarm.
- In case of a black-out, all pumps cease functioning. After restoration of power supply, the pumps restart after a preset time.
- Pressure and operational mode of the pumps, black-out as well as standby alarms are indicated by status LEDs.
- Labelling can be exchanged easily.

AHD 408 A

- Microprocessor controlled device for flush mounting.
- Mainly used for lubrication and gearbox oil pumps, where the main pumps are directly driven off a diesel engine.
- Controls the standby pumps relative to oil pressure and diesel engine speed.
- Standby pumps are switched on at low engine speed (normal), and also at high engine speed combined with falling pressure (abnormal, standby alarm).
- Labelling can be exchanged easily.

AHD 408 E-K

- Microprocessor controlled device for flush mounting.
- Upper half of device is for one pair of standby pumps (compare AHD 408E)
- Lower half is for one pair of compressors and operates as follows:
- Switches on main and standby compressor relative to air pressure.
- If the running time of the main and standby compressor exceeds the preset time, a standby alarm is triggered.
- A selector switch for main and standby compressor is installed on the panel.
- In case of a blackout, both compressors cease functioning. After restoration of power, they start after a preset time.
- Labelling can be exchanged easily.

All devices GL-certified

BÖNING Automationstechnologie

Development, manufacturing and service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • www.boening.com • e-mail: info@boening.com

Standby Pump and Compressor Control - Series AHD 408

Contents

		Page
1.	General information about all types of devices	3
2.	AHD 408E, standby-pump control for 2 pairs of electrical pumps	3
2.1	Features	3
2.2	Remote control of the pumps	4
2.3	System failure	4
	Terminal diagramme	5
	Programming	5
	Technical data	5
	Labelling of panel	5
	Standby-pump control AHD 408E with remote control	6
	Dimensional drawing	13
3.	AHD 408A, standby-pump control for appended main pumps	7
3.1	Features	7
	Terminal diagramme	8
	Programming	8
	Technical data	8
	Labelling of panel	8
	Dimensional drawing	13
4.	AHD 408AE, as AHD 408 A, but with additional priming-pump control and exclusion of unimportant consumers	9
4.1	Features	9
	Terminal diagramme	10
	Programming	10
	Technical data	10
	Labelling of panel	10
	Dimensional drawing	13
5.	AHD 408E-K, standby-pump and compressor control	11
5.1	Features	11
	Terminal diagramme	12
	Programming	12
	Technical data	12
	Labelling of panel	12
	Dimensional drawing	13
	System report for the alarm system	14
	Cut-out text labels	15

Description

1. General remarks for all types of devices

AHD 408-systems are microprocessor-controlled devices for flush mounting. They are plug-in units which consist of two electronic cards in a sandwich-construction and a front panel. It is accommodated in a housing compliant with DIN 43700. The front dimensions are 72 mm x 144 mm and the installation depth is 216 mm.

All inputs and outputs are led to a 24-pole terminal block, which is located on the rear side of the housing. The inputs are separated from the rest of the electronics by optocouplers. There are floating relay contacts available for activation of the pump contactors and/or compressor contactors. In case of auxiliary power failure or electronic fault the system returns automatically to a working condition.

One type of housing is used for all devices. The terminals are arranged in such a way to avoid damage which might otherwise result from unintentionally fitting an incorrect plug-in unit. A plug-in unit type AHD 408E in a housing of e. g. AHD 408A will not function. It will, however, cause no damage.

The label card in the front panel can be inserted from above. In order to change the card, the plug-in unit has to be withdrawn a little. The label card is protected by transparent plastic foil.

The devices can be supplied with a standard front frame or a plastic cover to increase the degree of protection.

2. AHD 408E, standby-pump control for 2 independently operating pairs of electrical pumps

2.1 Features

For each pair of standby pumps, two keys are installed on the front panel. The selector switch ‘Main Pump’ determines which of the two pumps (1 or 2) is to act as main pump. Thus, the other pump is defined as standby pump. The pump pairs are activated by selecting the corresponding ‘ON’ button.

When switched on, the computer system first checks whether the pressure is sufficient. As this won’t be the case very often, the standby pump starts first to build up the pressure. Once the pressure is sufficient the standby pump cuts out and the main pump starts. The delay interval can be programmed (t4). It is thus ensured that the standby-pump is operational at all times. Should the standby pump fail to build up sufficient pressure within the programmed delay interval (t1), a standby alarm is triggered.

Should the pressure fall during operation, the main pump cuts out and the standby-pump is started after elapsing of time (t4). Simultaneously, the standby-alarm is triggered as follows:

- red LED STANDBY-ALARM flashes on the front panel
- transistor output with same labelling for remote indicator is activated
- relay contact for collective alarm opens
- relay contact for collective alarm repetition closes for approx. 3s and then reopens

In the event of a power failure affecting the pumps during operation (blackout), the relays of the standby-pump control automatically switch to a position preventing immediate start-up of

the pumps once power is restored. The pumps are not reactivated until the programmed delay interval (t3) has elapsed. This prevents overload of the board power system. The time t1 is used to build up pressure again.

In case of power failure or electronics breakdown, all relays switch to standby position. When the pump control is activated, the main pumps are switched. Most likely, they were already in operation.

Even in case of breakdown of the electronics, the service pump can be switched on manually by means of the selector switch. As the collective alarm relay also shuts off in this case, a signal is transmitted to a commonly installed alarm system.

Besides the mentioned function, the ON switches also have a reset function. An active standby alarm is reset by switching off and then on again.

2.2 Remote control of the pumps

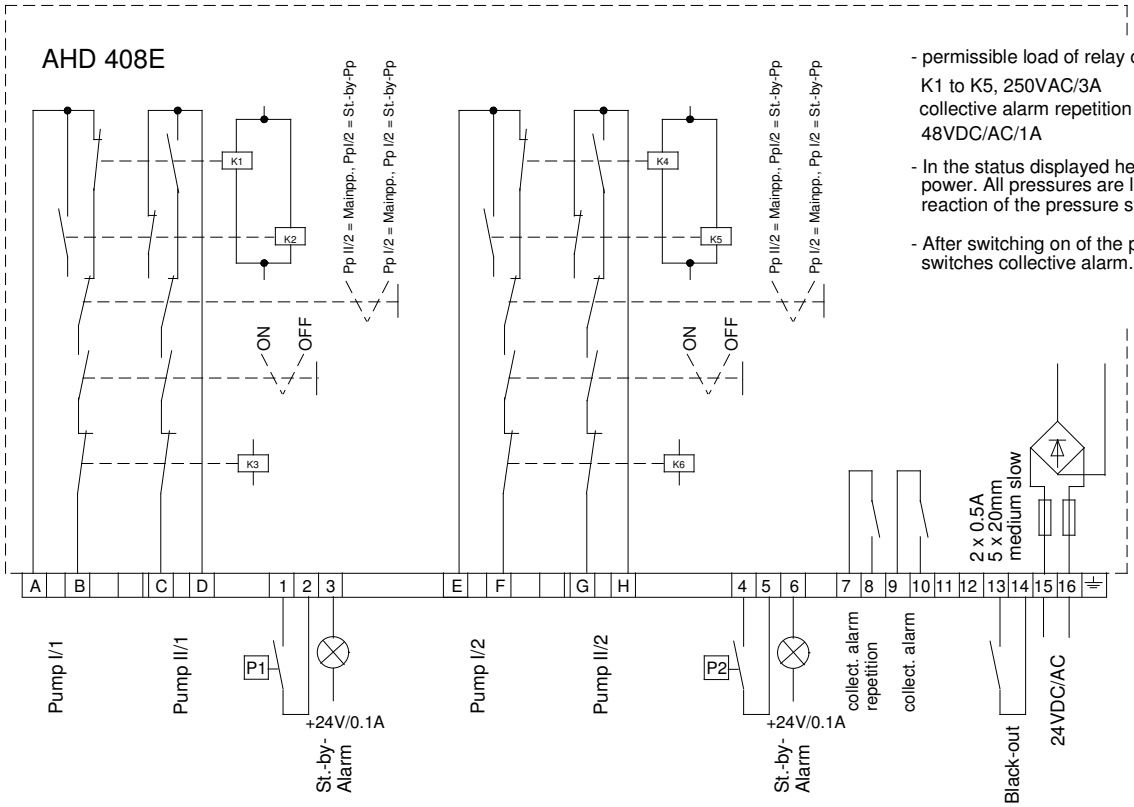
The previously described function refers to local operation, i.e. the pump control is located near the pumps or in the engine control room. If a remote control, e.g. on the bridge, is required, an additional binary data station PS 47-1-08 is necessary (see page 5 of this manual).

The switches with the function ‘Remote control - Stop - Local control’ (S3) and the selector switches with ‘stop function’ (S1, S2) are connected to this binary data station. The station transforms the switch positions to a serial output signal which is transmitted via a single wire to the standby pump control.

If the switch S3 is in ‘Local Control’ position, the remote control is switched off and AHD 408E is operated directly at the device. In this case S1 and S2 have no function. If the switch is in ‘Remote Control’ position, the switches S1 and S2 are enabled, i.e. they are selector switches to determine which pumps shall work as main or standby pumps. The pumps can also be switched off from here.

2.3 System failure

In case of a failure of the standby-pump-control, the red LED indicates ‘System Fault’ on the front panel by a permanent light. Furthermore, the collective alarm relay shuts off. If the binary data station PS 47-1-08 does not transmit any data, or if the switches S1, S2 or S3 are not connected correctly, the LED ‘System Fault’ flashes. The collective-alarm relay also shuts off. The ‘collective-alarm repeat relay’ responds for a few seconds.



- permissible load of relay contacts
  K1 to K5, 250VAC/3A
  collective alarm repetition and collective alarm relay
  48VDC/AC/1A
- In the status displayed here, the device is without power. All pressures are lower than the point of reaction of the pressure switches.
- After switching on of the power supply, the relay switches collective alarm.

The EEprom (Type 28C64) is located on the upper card of the plug-in unit. If it has to be reprogrammed, the plug-in unit has to be torn out after loosening the screw in the front panel.

Upper part of device	EEprom address	Content (min)	EEprom address	Content (sec)	EEprom address	Content[1] (NC/NO)
t1	1700		1701		----	----
t2	----	----	1702		----	----
t3	----	----	1703		----	----
t4	----	----	1705		----	----
Press. switch	----	----	----	----	1704	

1) Pressure at closed contact → Content of address = 01
   Pressure at opened contact → Content of address = 00

t1) Permitted time from switching on the st.-by-pump until reaching operating pressure during the start program. This time is identical with the time that is available for the operating pump after a black-out to redevelop the pressure (0-99min and 59s).

t2) Time between pressure drop and stopping of the main pump (0-99s)

t3) Time until restarting of the operating pump after a black-out (0-99s).

t4) Time from stopping of the st.-by-pump until starting of the main pump during the start program and at st.-by-alarm from main pump off until st.-by-pump on.

Lower part of device	EEprom address	Content (min)	EEprom address	Content (sec)	EEprom address	Content[1] (NC/NO)
t1	1710		1711		----	----
t2	----	----	1712		----	----
t3	----	----	1713		----	----
t4	----	----	1715		----	----
Press. switch	----	----	----	----	1714	

TECHNICAL DATA

Power supply	: 24VDC/AC
Consumption of the electronics	: app. 0.3A
Degree of protection	
- Front	: - IP 20 (with front-cap IP 54)
- Rear	: - IP 00
Installation depth	: 216mm
Panel cutout	: 138mm x 67mm
Weight	: app. 1kg

Marking of the pump circuit →

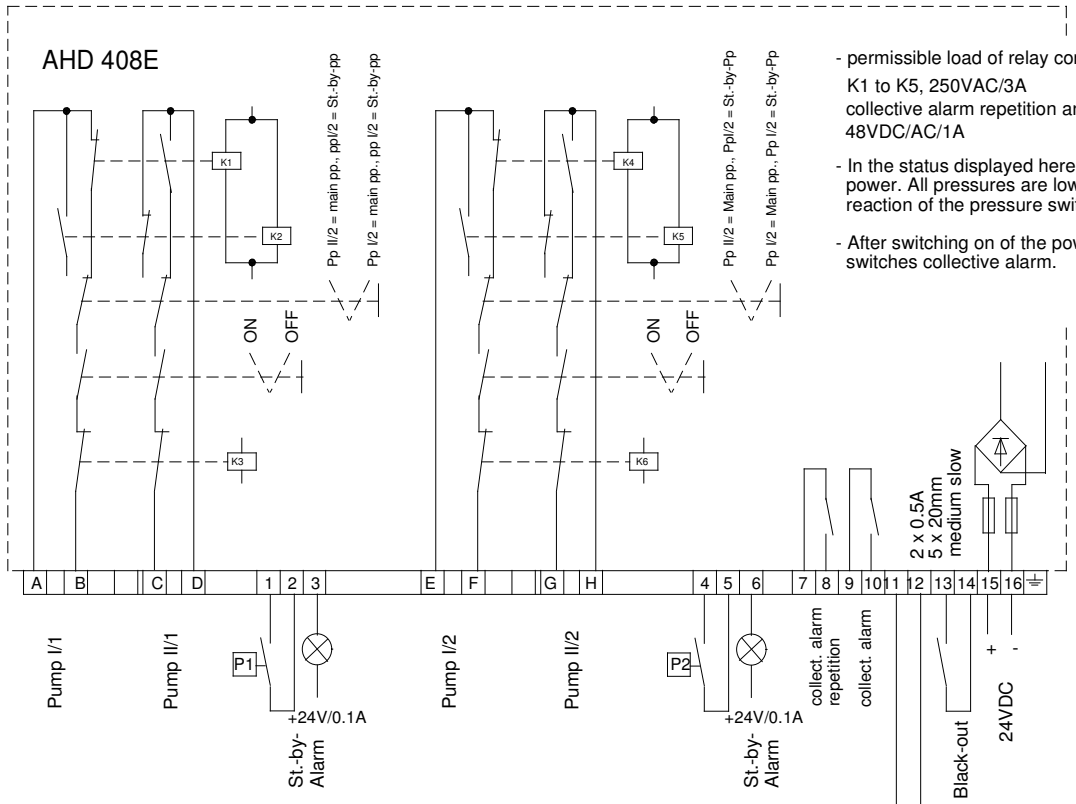
Marking of the pump circuit →

MAIN PUMP
ST.-BY-PUMP
ST.-BY-ALARM
PRESSURE NORMAL
MAIN PUMP
ST.-BY-PUMP
ST.-BY-ALARM
PRESSURE NORMAL

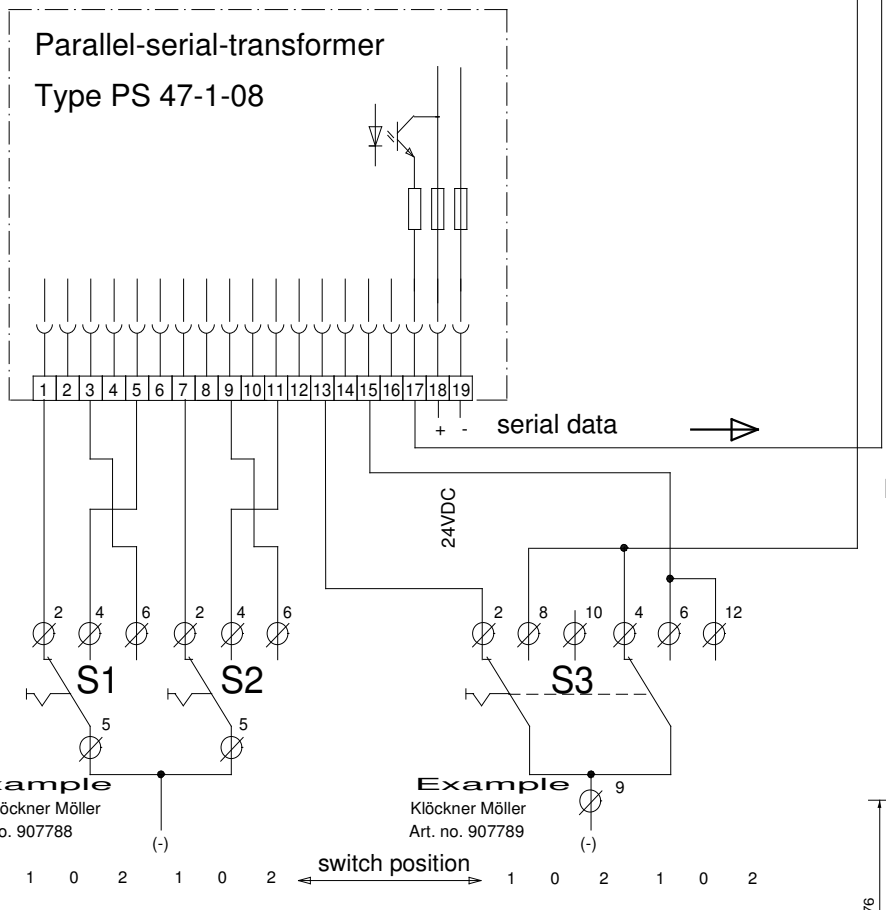
Text field for marking, cutting out and insertion from top into the front panel.

E1f-e.mcd

St.-By Pump Control AHD 408E with Remote Control



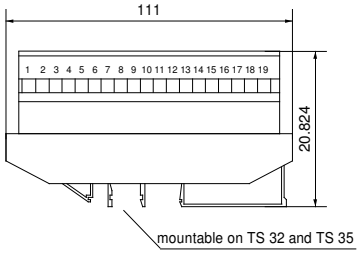
- permissible load of relay contacts
  K1 to K5, 250VAC/3A
  collective alarm repetition and collective alarm relay
  48VDC/AC/1A
- In the status displayed here, the device is without power. All pressures are lower than the point of reaction of the pressure switches.
- After switching on of the power supply, the relay switches collective alarm.

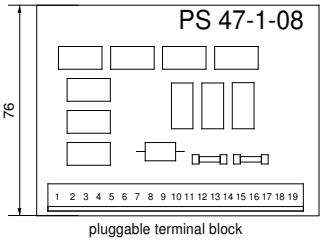


Pos 1: Pump I = main pump, pump II = st.-by-pump
Pos 0: Pump I and II stop
Pos 2: Pump II = main pump, pump I = st.-by-pump

Pos 1: Remote control
Pos 0: All pumps stop
Pos 2: Local control

Dimensional drawing PS 47-1-08





3. AHD 408A standby pump control for appended main pumps

3.1 Function

AHD 408A incorporates two controls for each standby-pump, which work independently of each other. The main pumps are driven by the ship's main engine.

There are three different operational states:

- If the standby pump control is switched off, the relay to activate the contactor relay is shut off (contact open). Pressure and engine speed switch have no influence.

- If the standby pump control is switched on and the engine is either not running or merely idling the standby pump is switched on. During these normal conditions no standby alarm is triggered. If the engine revolutions are increased so that the engine-speed switch reacts, the standby pump stops after a programmable time (t2).

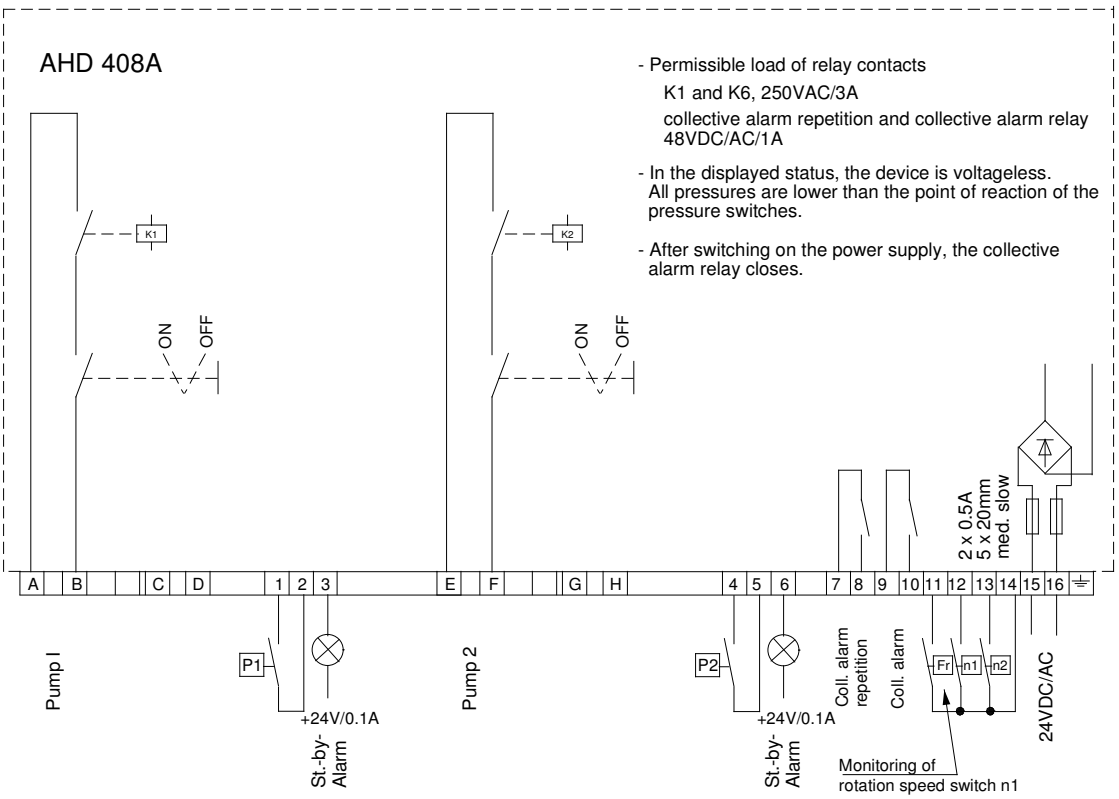
- If there is a fall in pressure at high engine revolutions, the standby pump is activated again after the programmable time t1. Simultaneously, a standby alarm is triggered as follows:

  - red LED 'STANDBY ALARM' flashes on the front panel
  - transistor output with same labelling for remote indicator is activated
  - relay contact for collective alarm opens
  - relay contact for collective alarm repetition closes for approx. 3s and then reopens

In case of tachogenerator failure, it is possible that the electric standby pump is running, too, despite a high speed and sufficient pressure that is generated by the attached main pump. In order to avoid this, the control has an input Fr, which, if it is activated, monitors the speed sensor n1. If the input Fr is activated and there is no signal from the speed sensor n1, an alarm will be triggered. This means that the LED 'Speed high' flashes and the collective alarm relay shuts off. The collective alarm repetition relay closes for approx. 3s and then reopens.

AHD 408A

- Permissible load of relay contacts
  K1 and K6, 250VAC/3A
  collective alarm repetition and collective alarm relay
  48VDC/AC/1A
- In the displayed status, the device is voltageless.
  All pressures are lower than the point of reaction of the pressure switches.
- After switching on the power supply, the collective alarm relay closes.



The EEprom (Type 28C64) is located on the upper card of the plug-in unit. If it has to be reprogrammed, it has to be torn out after loosening of the screw in the front panel.

Upper half of device	EEprom address	Content (sec)	EEprom address	Content (1) (NC/NO)
t1	0700		----	----
t2	0701		----	----
Press. switch	----	----	0720	
Rot.sp.switch	----	----	0721	
Switch Fr	----	----	0724	

1) Pressure or rotation speed at closed contact → Content of address = 00
   Pressure or rotation speed at open contact → Content of address = 01

   Monitoring of rotation speed switch for the upper half of the device (n1) by closed switch Fr and content of address 0725 = 01 → Content of address = 00

   Überwachung des Drehzahlschalters für die obere Gerätehälfte (n1) durch geöffneten Schalter Fr und Inhalt der Adresse 0725 = 01 → Content of address = 01

Switch Fr. available?	Address	Content
If yes, content 01, if not, content 00	0725	

t1) Time between pressure drop and starting of the st.-by-pump at high rotation speed (alarm, 0-99s).

t2) Switching-off of the st.-by-pump at running engine after "rotation speed switch off" and "pressure normal" (0-99s).

Lower half of device	EEprom address	Content (sec)	EEprom address	Content (1) (NC/NO)
t1	0710		----	----
t2	0711		----	----
Press. switch	----	----	0722	
Rot.sp.switch	----	----	0723	

TECHNICAL DATA

Power supply	: 24VDC/AC
Power cons. of the electronics	: ca. 0.3A
Degree of protection	
- Front	: - IP 20 (with front-cap IP 54)
- Rear	: - IP 00
Installation depth	: 216mm
Panel cutout	: 138mm x 67mm
Weight	: ca. 1kg

Marking of the pump circuit →

St.-by-pump
St.-by-alarm
Rot. speed high
Press. normal

Marking of the pump circuit →

St.-by-pump
St.-by-alarm
Rot. speed high
Press. normal

Text field for lettering, cutting out and insertion into the front panel from above.

4. AHD 408A-E

Upper part of device

Standby pump control for one electric prelubrification pump and one standby pump each. The main pump is attached to the engine and not affected by the control.

Lower part of device

As AHD 408A, but without transistor output for remote display standby alarm.

4.1 Function

The following description of function only refers to the upper part of the device.

We distinguish between the following states:

- When standby pump control is switched off, the relay controlling the standby pump has shut off (contact open). The control transistors for the prelubrification pump and for ‘switching off unimportant consumers’ can not be activated. Pressure and speed sensors do not have any effect.

- When standby pump control is switched on and engine is not running or idling, the prelubrification pump is activated. This state is normal, so there will be no standby alarm. If the speed is increased so that the engine-speed switch reacts, the prelubrification pump is switched off regardless of the pressure.

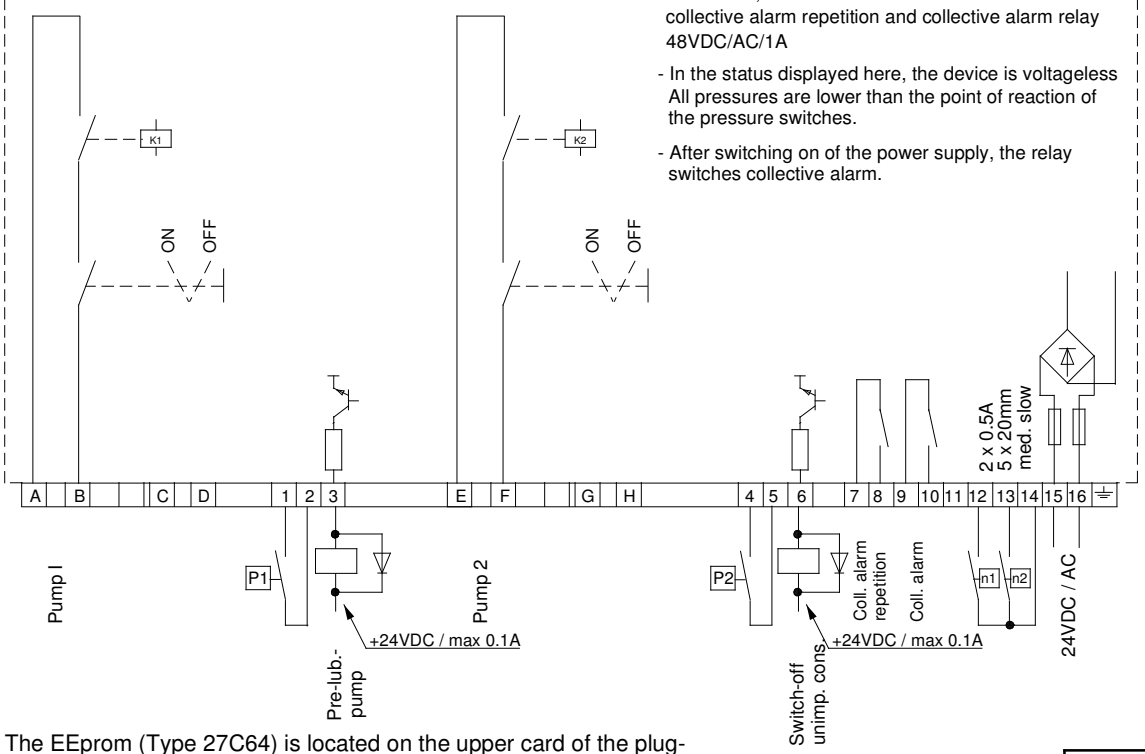
- The pressure has to be built up within a programmable time window t2. If that is not the case, a standby alarm will be triggered after time t1. This results in the following:

- The output ‘switch off unimportant consumers’ is activated. Approx. 1s after that the standby pump is activated. In case engine revolutions fall short of idling speed (manual or automatic stop), the speed sensor causes the standby pump to be switched off and the prelubrification pump to be switched on.

- red LED STANDBY ALARM lights up on the front panel
- transistor output STANDBY ALARM for remote indicator is activated
- collective alarm relay output is deactivated
- collective alarm repetition output is activated for approx. 3s and then is deactivated again

AHD 408AE

- Permissible load of relay contacts
  K1 and K6, 250VAC/3A
  collective alarm repetition and collective alarm relay
  48VDC/AC/1A
- In the status displayed here, the device is voltageless
  All pressures are lower than the point of reaction of the pressure switches.
- After switching on of the power supply, the relay switches collective alarm.



The EEprom (Type 27C64) is located on the upper card of the plug-in unit. If it has to be reprogrammed, the plug-in unit has to be torn out after loosening the screw in the front panel.

Upper part of device	EEprom address	Content (sec)	EEprom address	Content (NC/NO) (1)
t1	0700		----	----
t2	0708		----	----
Press. switch	----	----	0720	
Speed switch	----	----	0721	

1) Pressure and/or speed at closed contact → content of the address = 00
   Pressure and/or speed at opened contact → content of the address = 01

t1) Time between pressure drop and starting of the st.-by-pump at high speed (occurring alarm, 0-99s).

t2) After reaching high speed, pressure must have developped within this time. Otherwise, there will be a st.-by alarm after elapsing of time t1 (0-99s).

Lower part of device	EEprom address	Content (sec)	EEprom address	Content (NC/NO) (1)
t1	0710		----	----
t2	0711		----	----
Press. switch	----	----	0722	
Speed switch	----	----	0723	

1) Pressure and/or speed at closed contact → content of the address = 00
   Pressure and/or speed at opened contact → content of the address = 01

t1) Time between pressure drop and starting of the st.-by-pump at high speed (occurring alarm, 0-99s).

t2) Switching off of the st.-by-pump at running engine after speed switch off and pressure normal (0-99s).

TECHNICAL DATA

Power supply	: 24VDC/AC
Consumption of the electronics	: app 0.3A
Degree of protection	
- Front	: - IP 20 (with front-cap IP 54)
- Rear	: - IP 00
Installation depth	: 216mm
Panel cut-out	: 138mm x 67mm
Weight	: app. 1kg

Marking of the pump circuit →

Marking of the pump circuit →

PRE-LUB. OR ST.-BY- PUMP
ST.-BY-ALARM
SPEED HIGH
PRESSURE NORMAL
ST.-BY- PUMP
ST.-BY-ALARM
SPEED HIGH
PRESSURE NORMAL

Text field for lettering, cutting out and insertion from above into the front panel.

5. AHD 408E-K, combined standby pump and compressor control

5.1 Function

AHD 408E-K comprises a standby pump control for electric main pumps and standby pumps and a standby compressor control. Operation is identical to AHD 408E.

The compressor control works as follows:

One selector switch ‘MAIN COMPR’ and one switch ‘ON’ are installed on the front panel of the device. The ‘ON’ switch activates the device. The selector switch determines which compressor shall operate as main compressor.

Control is by means of the following three pressure switches:

P1 low pressure
P2 medium pressure
P3 high pressure

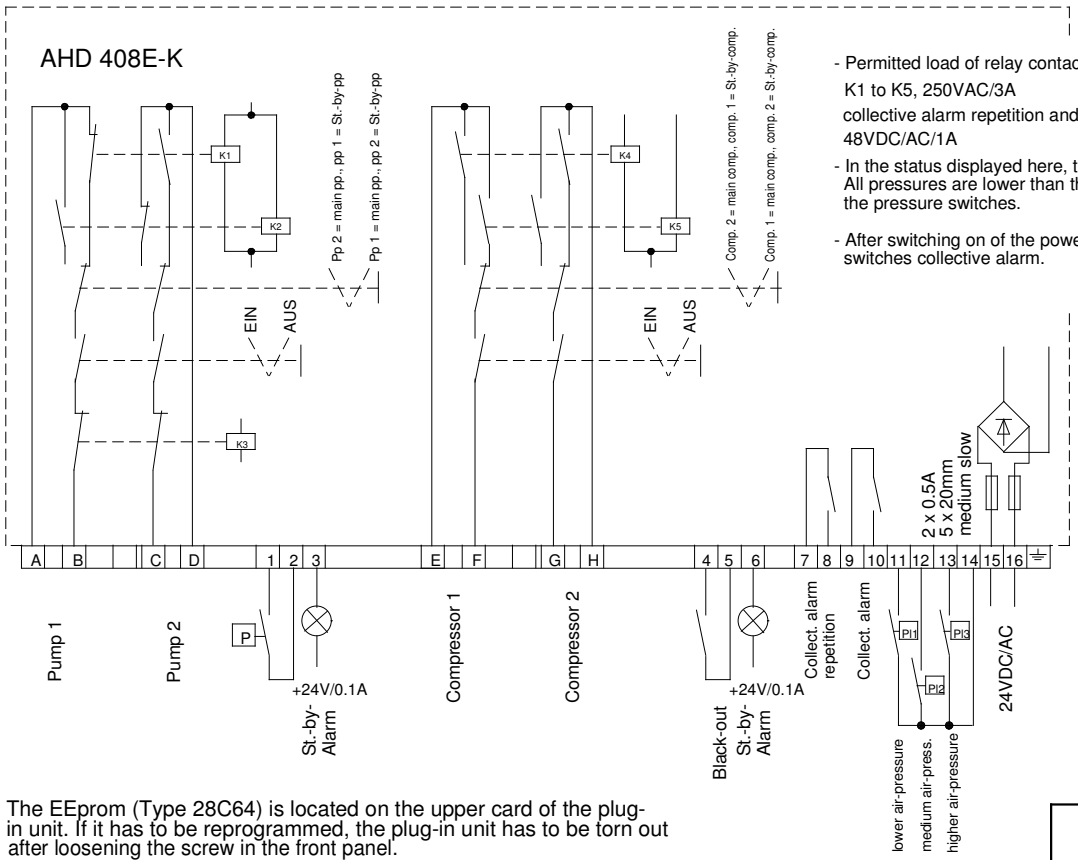
After the control device is switched on the system checks the condition of the pressure switches. If the pressure is lower than P1 (e. g. on commissioning), the main compressor starts up immediately. If the air pressure required is so high that P3 is not reached the standby compressor is activated. Both compressors switch off when P3 is reached. When both compressors do not succeed in building up pressure P3 after time t3 has elapsed, a status message is issued as follows:

- red LED STANDBY ALARM lights up on the front panel
- transistor output STANDBY ALARM for remote indicator is activated
- collective alarm relay output is deactivated
- collective alarm repetition output is activated for approx. 3s and then is deactivated again

The status message can be cancelled by briefly switching off the ‘ON’-switch.

During normal operation, the main compressor is activated when pressure falls below P2 and after elapsing of time t1 and is deactivated again on reaching P3. In case of a blackout, all compressors cease operating. After restoration of power and elapsing of time t1, the previous state of operation is restored.

E3-e.mcd



- Permitted load of relay contacts
  K1 to K5, 250VAC/3A
  collective alarm repetition and collective alarm relay
  48VDC/AC/1A
- In the status displayed here, the device is voltageless. All pressures are lower than the point of reaction of the pressure switches.
- After switching on of the power supply, the relay switches collective alarm.

The EEprom (Type 28C64) is located on the upper card of the plug-in unit. If it has to be reprogrammed, the plug-in unit has to be torn out after loosening the screw in the front panel.

Upper part of device	EEprom address	Content (min)	EEprom address	Content (sec)
t1	0700		0701	
t2	----	----	0702	
t3	----	----	0703	

1) Pressure at closed contact ⟹ content of the address = 0
   Pressure at open contact ⟹ content of the address = 01

t1) Permitted time from switching on the st.-by-pump until reaching operating pressure during the start program. This time is the same as the time that is available for the operating pump after a black-out to redevelop the pressure (0-99min and 59s) .

t2) Time between pressure drop and stopping of the main pump (0-99s)

t3) Time until restarting of the operating pump after a black-out (0-99s).

Compressor-control	EEprom address	Content (min)	EEprom address	Content (sec)	EEprom address	Content (1) (NC/NO)
t1	----	----	0710		----	----
t2	----	----	0711		----	----
t3	0712		0713		----	----
Press. switch 1	----	----	----	----	0717	
Press. switch 2	----	----	----	----	0718	
Press. switch 3	----	----	----	----	0719	

NO = Pressure > Switch pressure when contact open; content of the address = 00
NC = Pressure > Switch pressure when contact closed; content of the address = 01

t1 = Time from p < p2 until starting of main compressor (0-99s).
It is equal to the time that has to pass after a black-out, before the main compressor is switched on again.

t2 = Time from p < p1 until starting of st.-by-compressor (0-99s).

t3 = Permissible time of operation of the st.-by- compressor until a St.-by-alarm is released, as far as p is< p2 (0-99min and 59s)

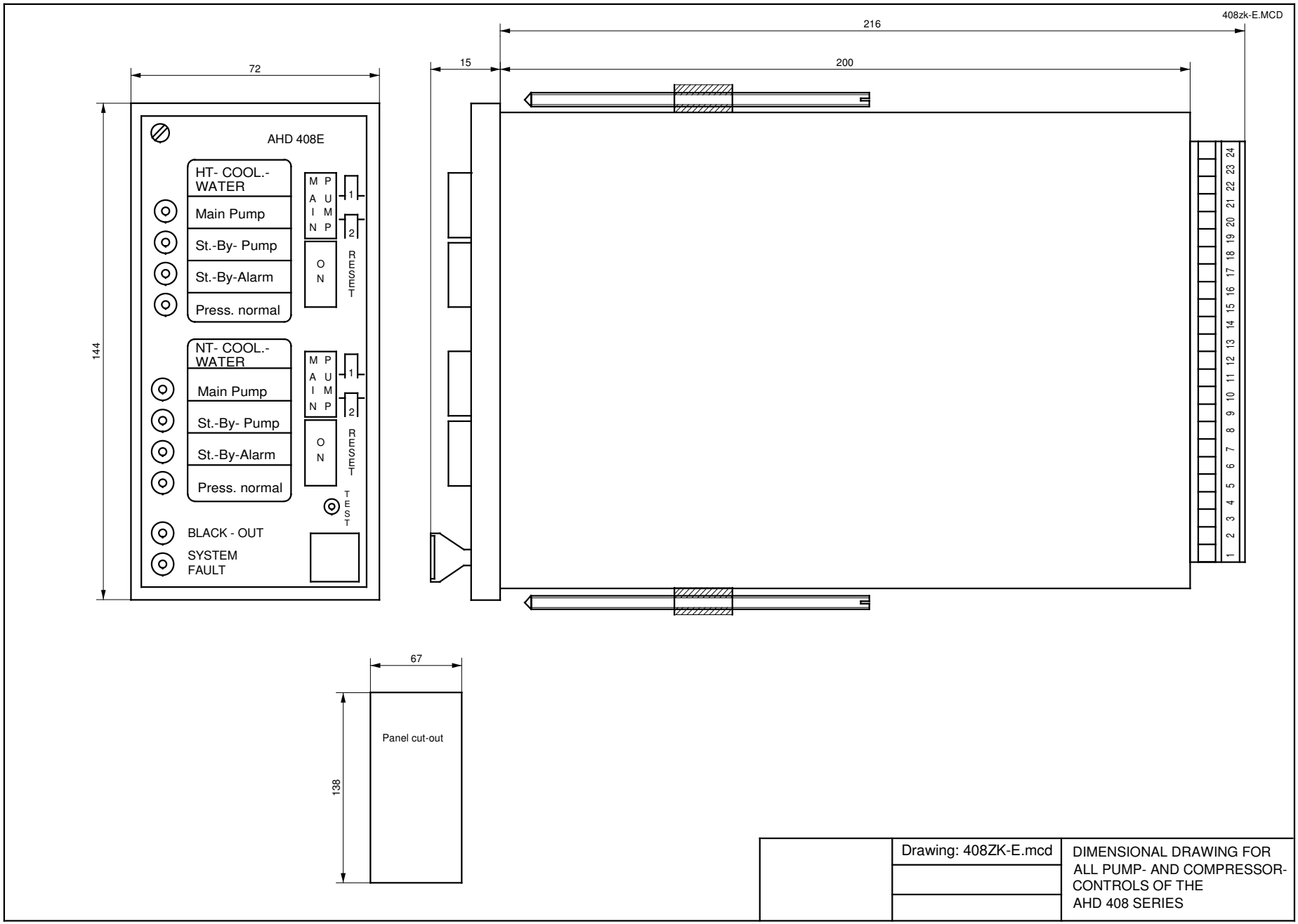
Marking of the pump circuit

Text field for labelling, cutting out and inserting from above into the front panel.

Main pump
St.-by-pump
St.-by-alarm
Pressure normal
Compressor-control
Main-compressor
St.-by-compressor
St.-by-alarm
Pressure >p2

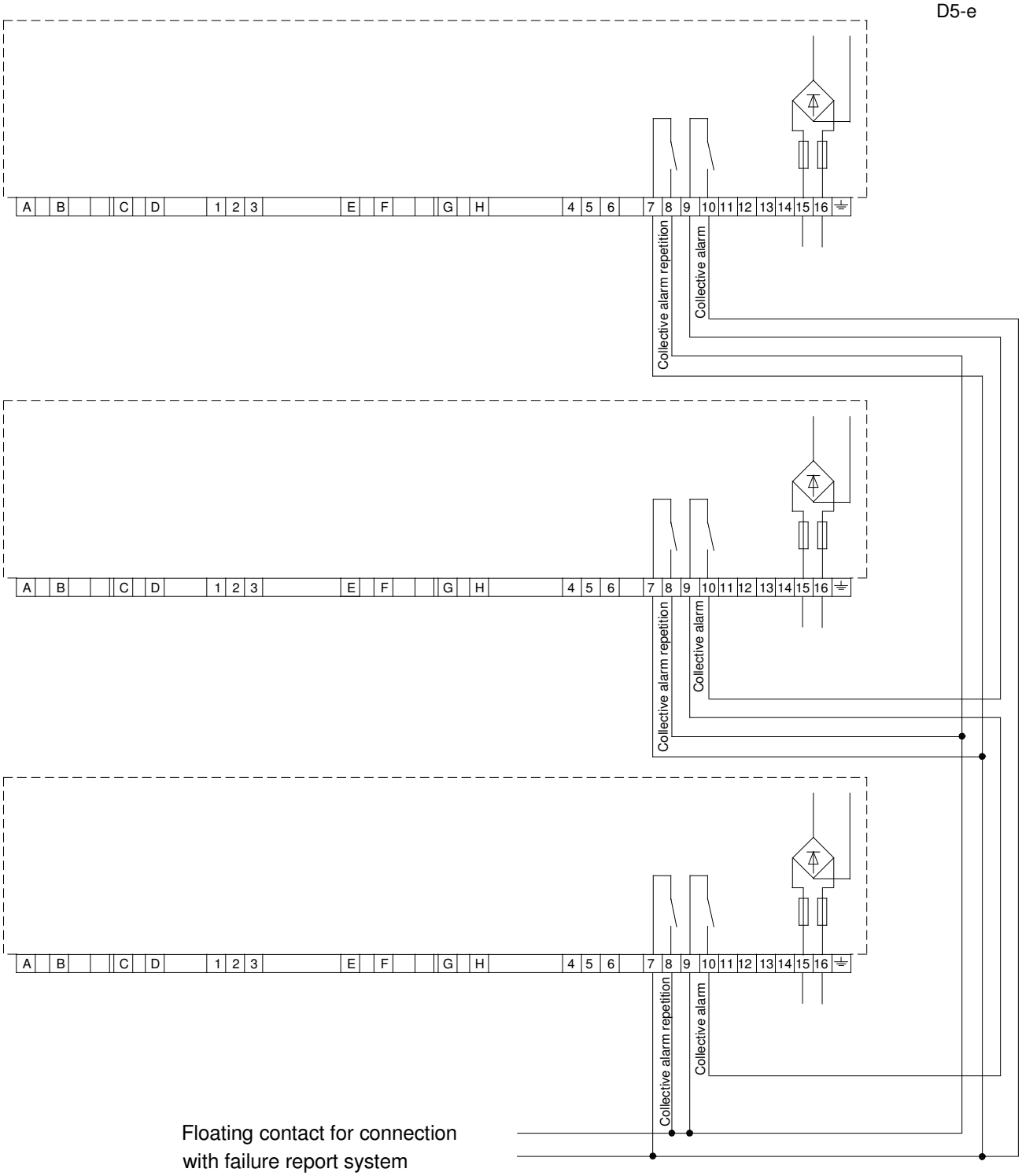
TECHNICAL DATA

Power supply	: 24VDC/AC
Consumption of the electronics	: app. 0.3A
Degree of protection	
- Front	: - IP 20 (with front-cap IP 54)
- Rear	: - IP 00
Installation depth	: 216mm
Panel cutout	: 138mm x 67mm
Weight	: app. 1kg



	Drawing: 408ZK-E.mcd	DIMENSIONAL DRAWING FOR ALL PUMP- AND COMPRESSOR-CONTROLS OF THE AHD 408 SERIES

D5-e



Collective report for the failure report system

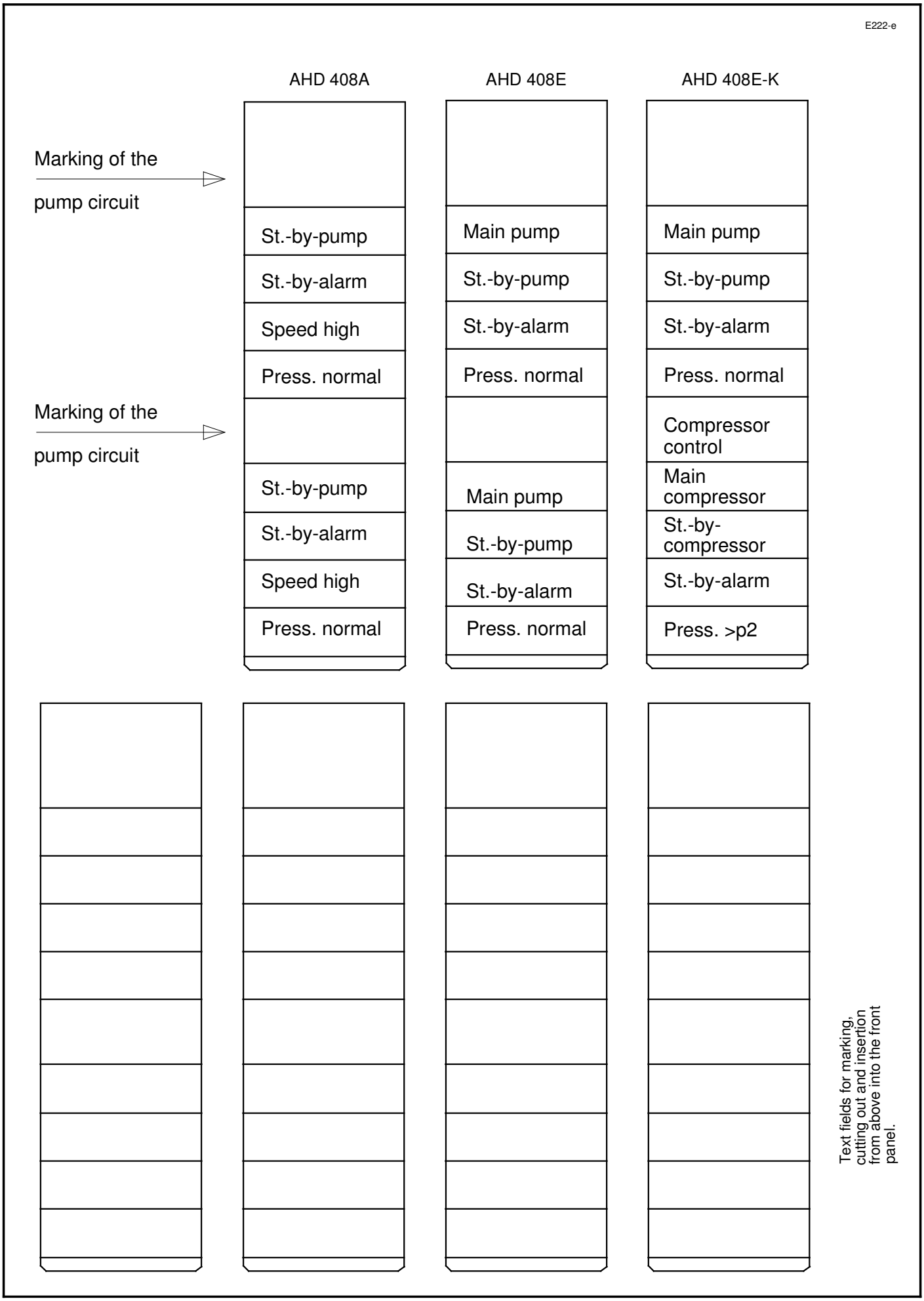
It is possible to lead the collective reports of an arbitrary amount of devices of the AHD 408 series onto a single measuring point of the failure report system. In order to do this, the collective report outputs are switched in line and all collective alarm repetition outputs are switched parallel. Both signals are then switched parallel again and led to the failure report system as floating contact.

The collective alarm contacts open in the event of a st.-by-alarm. The collective alarm repetition contacts close for approximately 3s. Thus, the measuring point in the failure report system is shortly reset and then activated again.

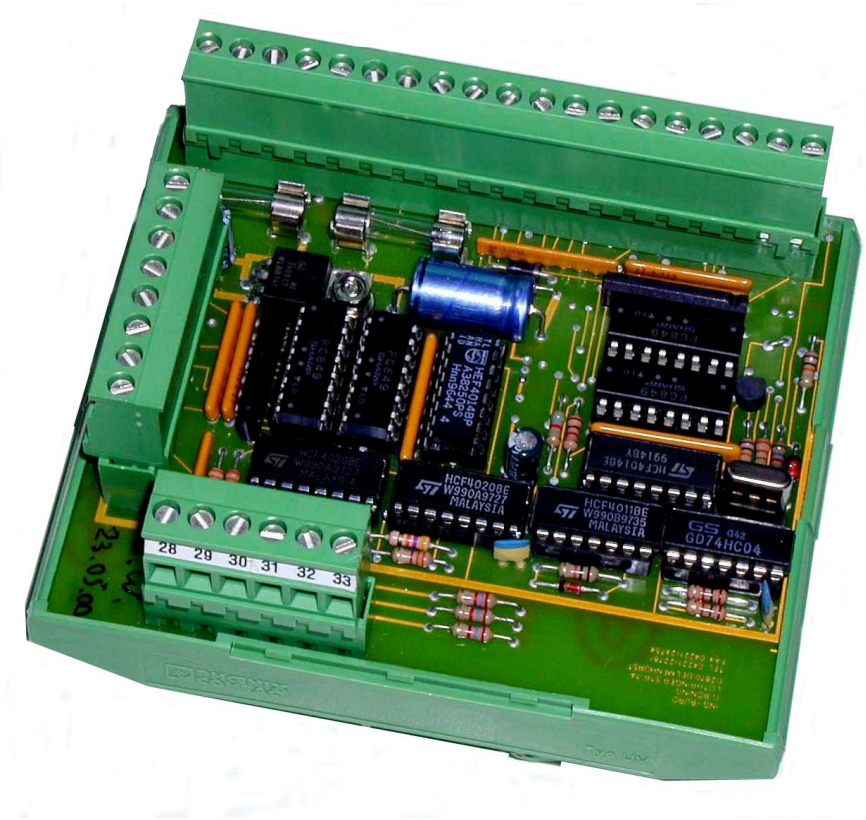
Thus it is ensured that every alarm leads to repeated addressing of the failure report system, even if it had already been activated by the report of a different device.

In this example, three devices are connected this way.

E222-e


AHD 408A
AHD 408E
AHD 408E-K
Marking of the
pump circuit
Marking of the
pump circuit
St.-by-pump
St.-by-alarm
Speed high
Press. normal
St.-by-pump
St.-by-alarm
Speed high
Press. normal
Main pump
St.-by-pump
St.-by-alarm
Press. normal
Main pump
St.-by-pump
St.-by-alarm
Press. normal
Main pump
St.-by-pump
St.-by-alarm
Press. >p2
Compressor control
Main compressor
St.-by-compressor
St.-by-alarm
Text fields for marking, cutting out and insertion from above into the front panel.

Binary Data Station
PS 47-1-15



1. Application

The binary data station accommodates up to 15 digital signals such as mechanical contacts, transistor outputs and other switches by means of optocouplers. The electronics transform the data into a serial output signal and transmit it via a single connection by means of an optocoupler (in case of galvanic seperation from the receiver via a dual connection).

By using PS 47-1-15 it is possible to reduce the amount of electrical connections from a max. 32 down to just 3 (incl. power supply), transmit the signals over a distance of up to 1,000 m and from that point distribute them to one or more receiver or analyzing units. Furthermore, it replaces the intermediate terminal block which the sensors are usually connected to. In case of simultaneous application of data distributor AHD W (Version A), decentralized failure report systems can be realized with minimized wiring.

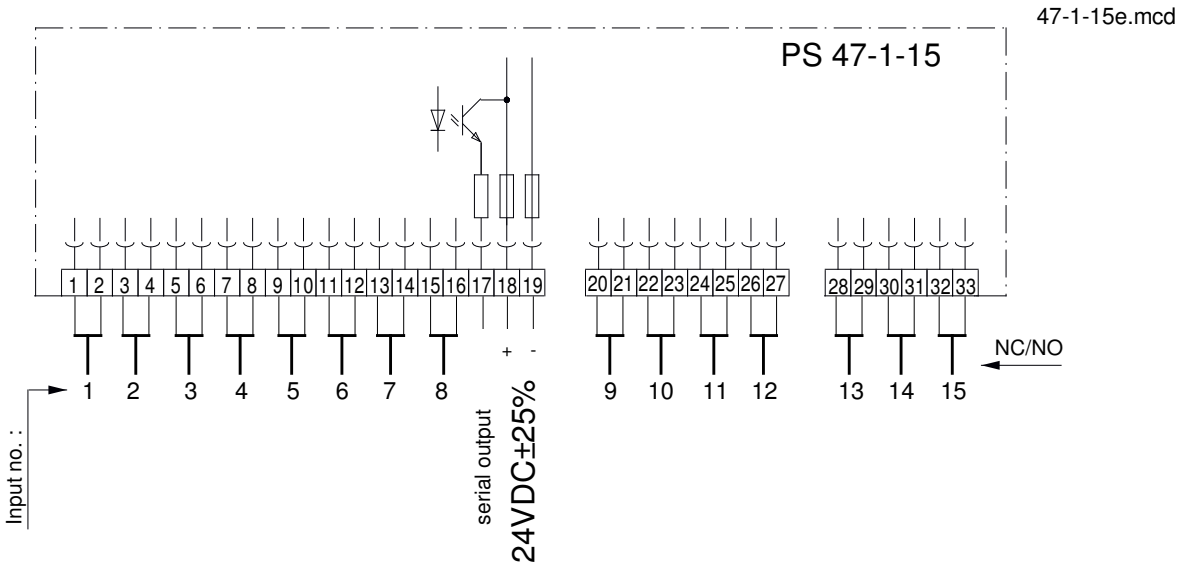
The inputs can be wired single or double pole. No external terminals are required for this.

- low power consumption (65 mA)
- compact and robust construction
- easy mounting on rails
- plug-in terminal blocks
- GL classification

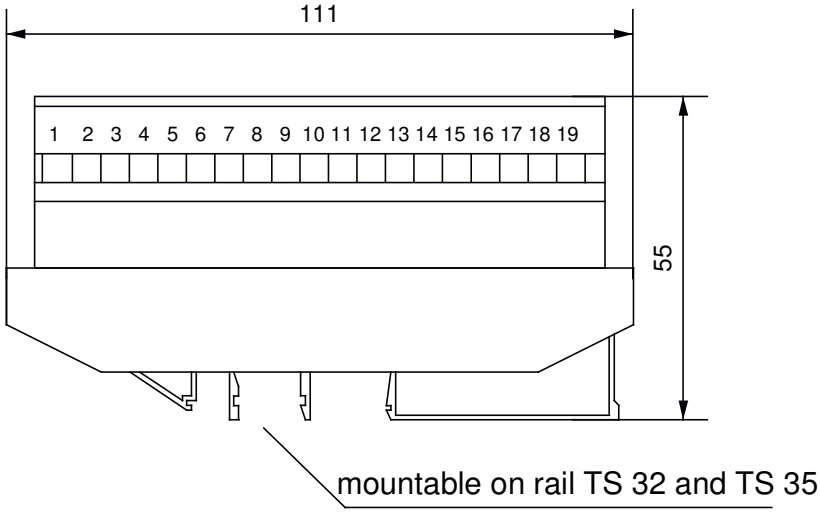
BÖNING Automationstechnologie

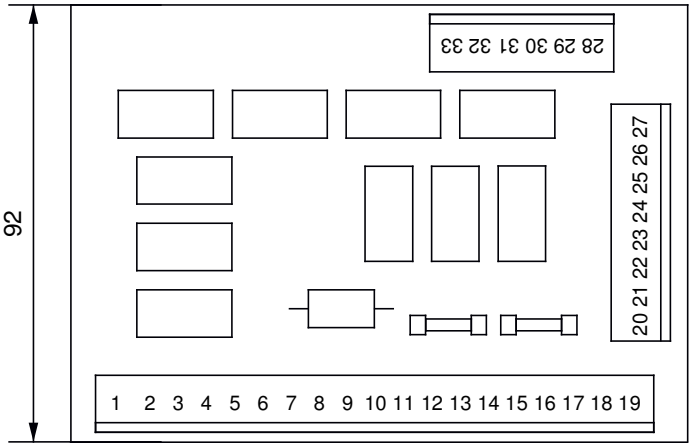
Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

2. Terminal diagram



3. Dimensional drawing



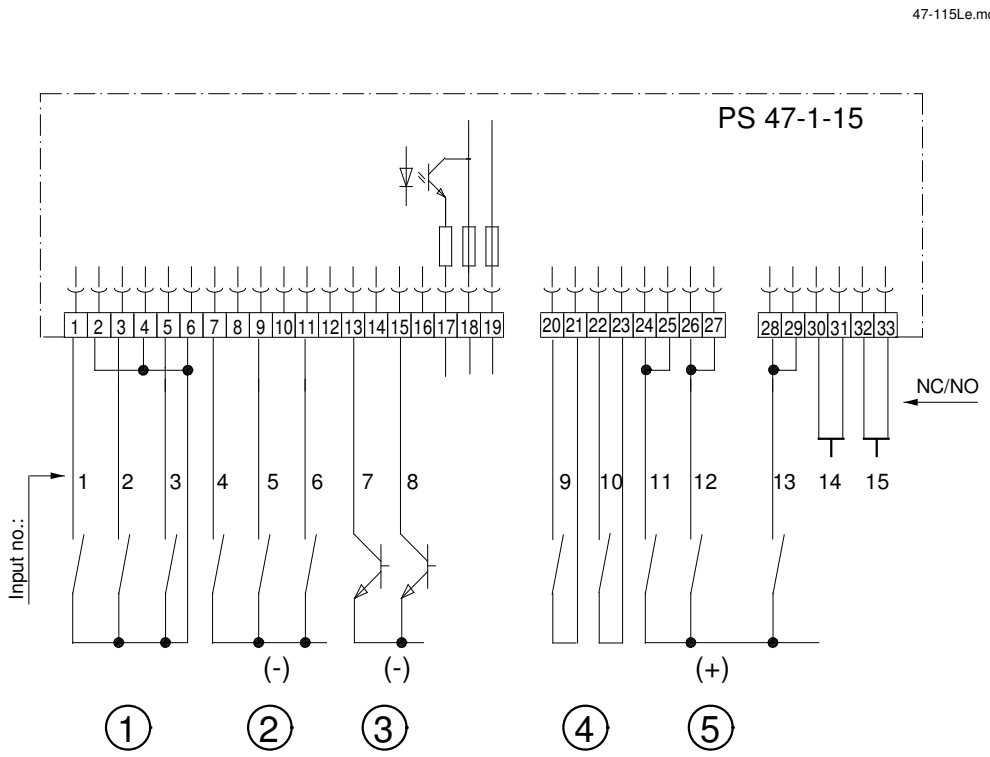


plug-in terminal blocks

4. Technical data

Power supply:	24VDC +/-25%
Power consumption:	approx. 65mA
Inputs:	15 optocoupler inputs
Outputs:	1 x serial via optocouplers
Data format:	1 start bit (high), 15 data bits in same order as the 15 inputs, high for closed contact, low for open contact, 16 bit low
Perm. relative air humidity:	99%
Perm. ambient humidity:	0-70°C
Weight:	0.2kg

5. Wiring possibilities of inputs



Example 1
Registration of 3 binary contacts with mutual refeeding.

Example 2
Registration of 3 binary contacts with mutual minus-connection. Every second terminal of one input remains idle.

Example 3
Registration of 2 transistors with mutual minus-connection (such sensors are wired like contacts). Every second terminal of one input remains idle.

Example 4
Registration of 2 contacts with 2-pole connection.

Example 5
Registration of 3 contacts that switch plus-potential. Here, the inputs are bypassed, in order to cause a potential alternation at switching of the contacts in the binary data station.

MEASURING POINT LIST FOR BINARY STATION PS 47-1-15

Input no.	Marking of measuring points	Kind of input (please mark applying) Contact (NC) (Opener)	Contact (NO) (Closer)	other	DATA FOR THE ALARMSYSTEM Delaytime On (1-99s)	Delaytime Off (1-99s)	Suppression by dest. system Meas. point no. (1 to 5 possible (also multiple))	Display ?	Dest.syst. (e.g. EDA no.2)	Meas. point no. of dest. system (e.g. 38)	Group (Bridge)	Group (Chamb.)	Print ?	LED-color in Alarmsystem (red, yellow, green)	REMARKS
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															

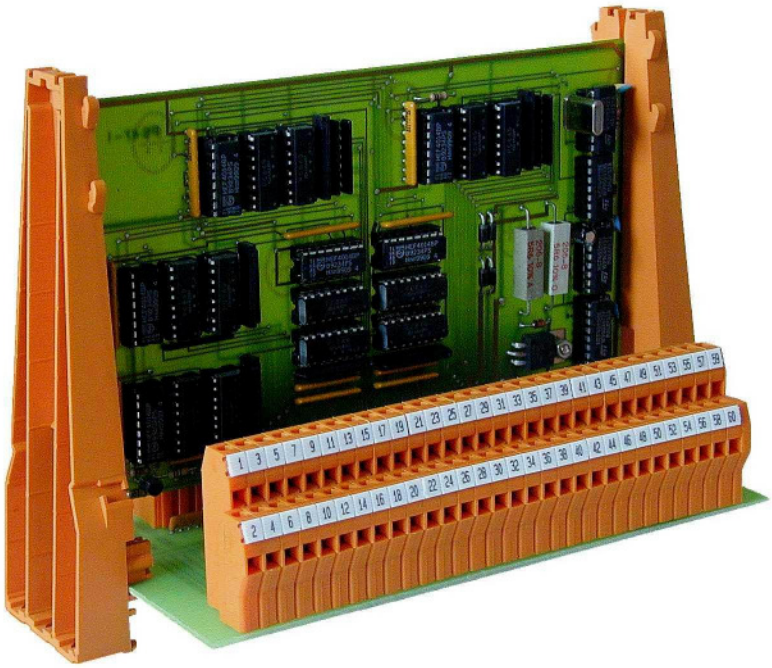
Client	
Shipyard	
Newb.	

Substation-no. U.....

DATE: .....

Binary data station PS 47-1

Parallel-serial transformer with 47 optocoupler inputs, with serial output for minimization of wiring



1. Application

The binary data station accommodates up to 15 digital signals such as mechanical contacts, transistor outputs and other switches by means of optocouplers. The electronics transform the data into a serial output signal and transmit it via a single connection by means of an optocoupler (in case of galvanic seperation from the receiver via a dual connection).

By using PS 47-1-15 it is possible to reduce the amount of electrical connections from a max. 94 down to just 3 (incl. power supply), transmit the signals over a distance of up to 1,000 m and from that point distribute them to one or more receiver or analyzing units. Furthermore, it replaces the intermediate terminal block which the sensors are usually connected to.

The following devices (e.g. see catalog) can be used as receiver and analyzing units:

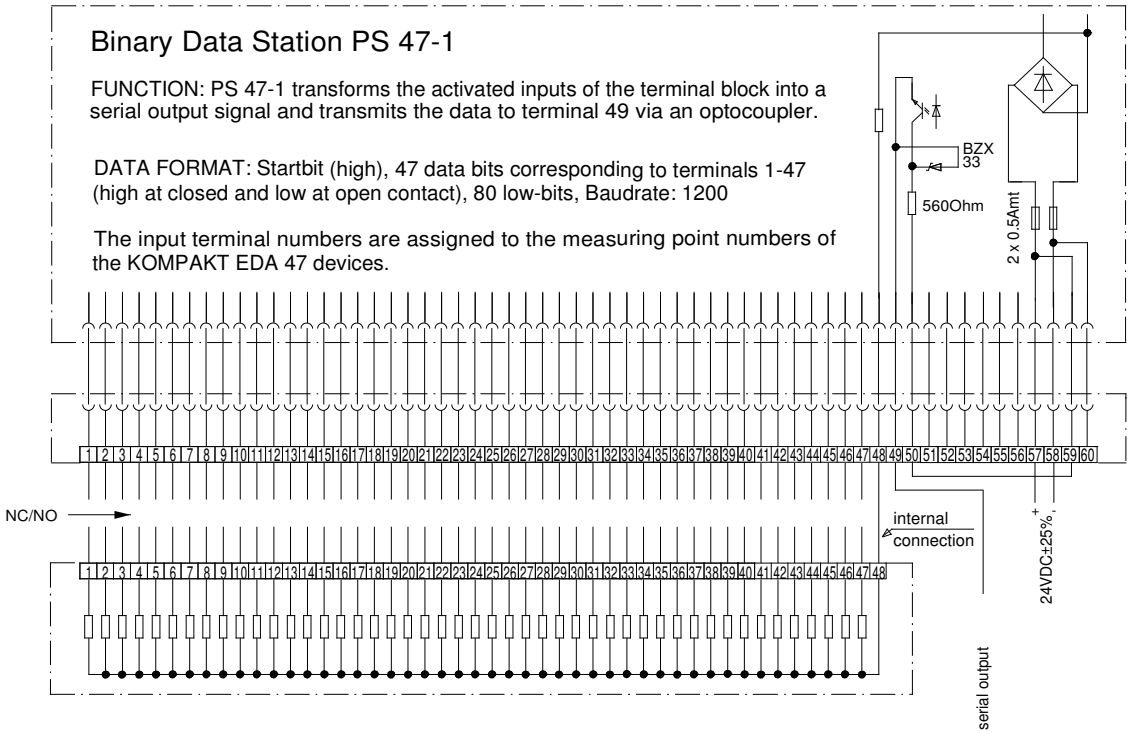
- Display and alarm system KOMPAKT EDA 47
- Serial-parallel transformer AHD 412
- Group panel AHD 406H
- Data distributor AHD W (version B)

The inputs can be wired single or double pole. No external terminals are required for this.
GL classification

BÖNING Automationstechnologie
Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

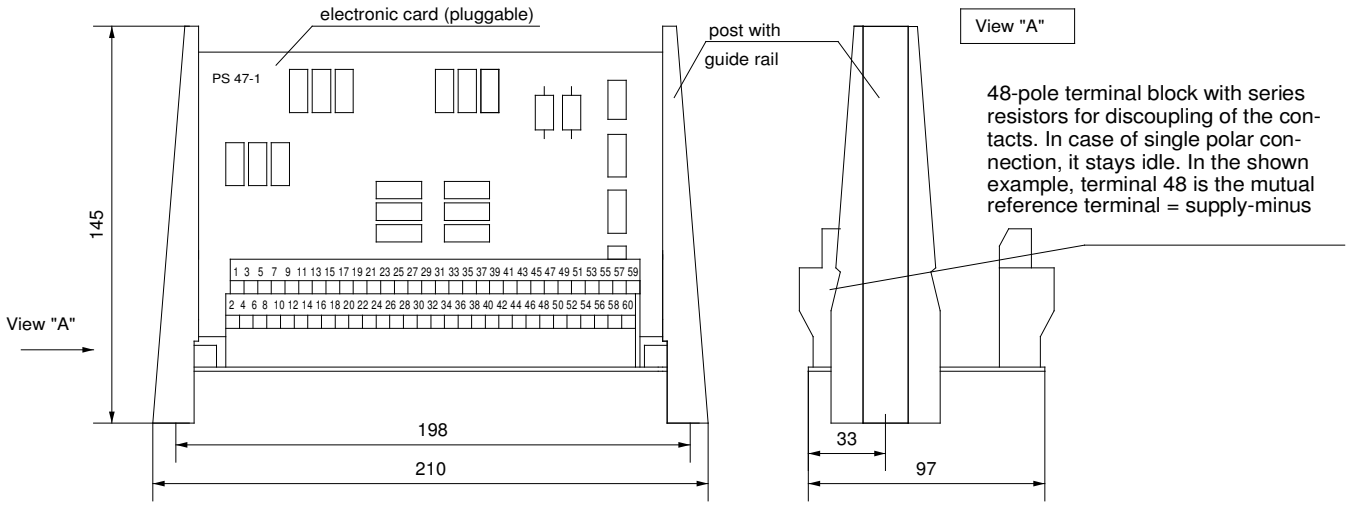
2. Terminal Diagram

PS471m2e.mcd



3. Dimensional Drawing

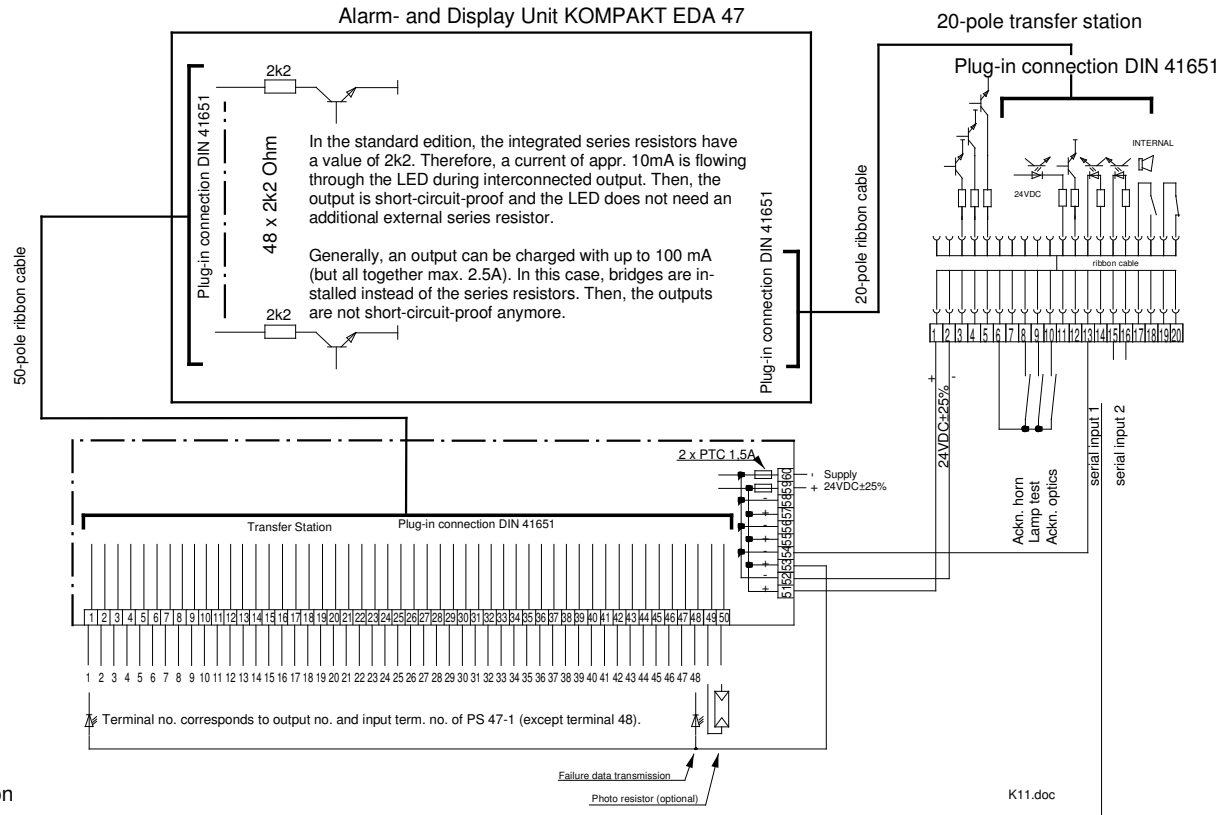
PS471mae.mcd



4. Technical Data

Power supply:	24VDC +/- 25%
Power consumption:	approx. 120 mA
Inputs:	47 optocoupler inputs
Outputs:	1 x serial via optocouplers
Data format:	1 start bit (high), 47 data bits in same order as the 47 inputs, high for closed contact, low for open contact, 80 bit low
Perm. relative air humidity:	99%
Perm. ambient humidity:	0-70°C
Weight:	approx. 1 kg

EXAMPLE OF USE



Function

The inputs at the binary data station PS47-1 are transformed into a serial output signal and transferred to the KOMPAKT EDA 47. This device registers and evaluates the data corresponding to their individual programming (see programming list).

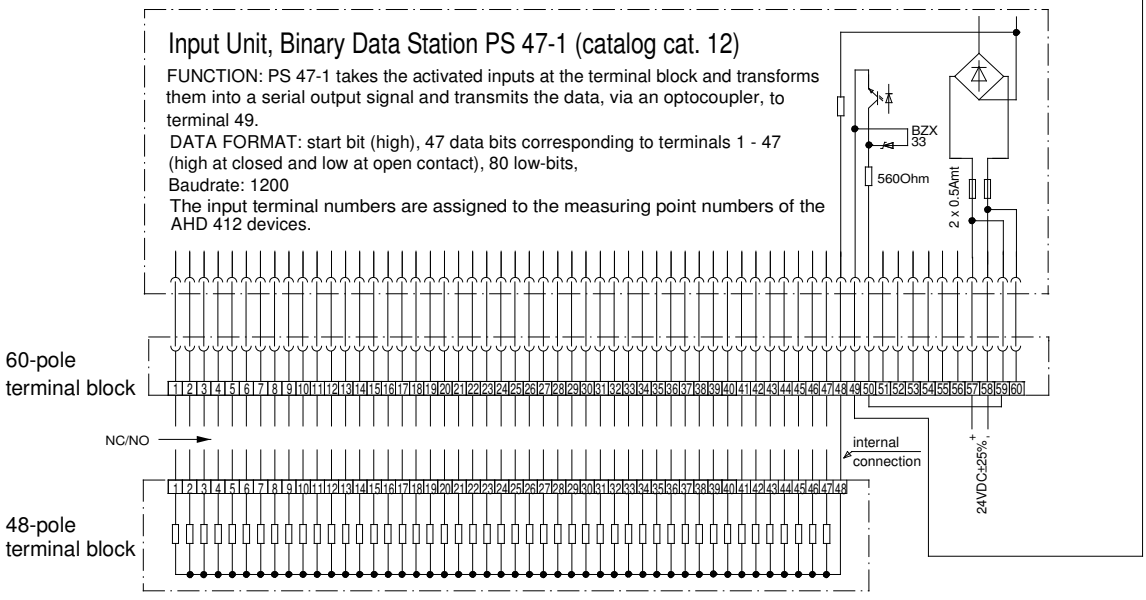
The following parameters of each measuring point (terminal no. at PS 47-1 = terminal no. at KOMPAKT EDA 47) can be programmed:

Display or alarm, switch-on and/or switch-off delay between 1 and 99 seconds, activated (blocked) by measuring point 1, 2, 3, 4 or/and 5, report as shutter (NO) or opener (NC), and/or with rising or falling analog signal.

In this example, both devices (PS47-1 and KOMPAKT EDA 47) must have a mutual power supply, or, in case of two sources, with mutual ground connection. For galvanically separated systems, the serial connection must be bipolar.

The input circuits do not have to be, as shown in the example, bipolar. In case of unipolar connection, the 48-pole terminal block remains idle. The mutual reference terminal is then connected with supply-minus. Mixed connections are also permitted. Besides mechanical switches, also transistor outputs, as they are often found in level- or proximity switches, can be used as input circuits.

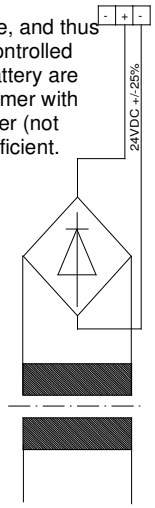
The cable for serial data transmission can be up to 1,000 meters long. In case there are stronger magnetic fields in the vicinity, the cable must be screened. Unused wires in the cable must be connected with supply-minus on both ends. The minimum diameter is 0.75mm².

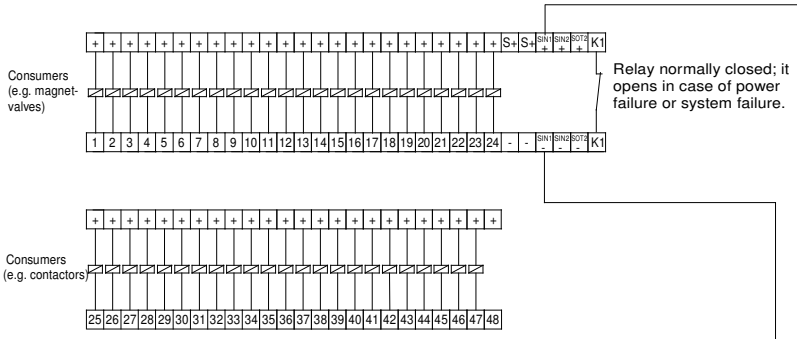


EXAMPLE OF USE FOR REMOTE DATA TRANSMISSION

Output Unit AHD 412

For supply of the device, and thus for the consumers, a controlled power supply unit or battery are not required. A transformer with downstream with rectifier (not part of delivery) are sufficient.





Perm. current per output is 1.5A, but a total of 50A. All outputs are individually short-circuit proof and thermically protected.

max 1000m

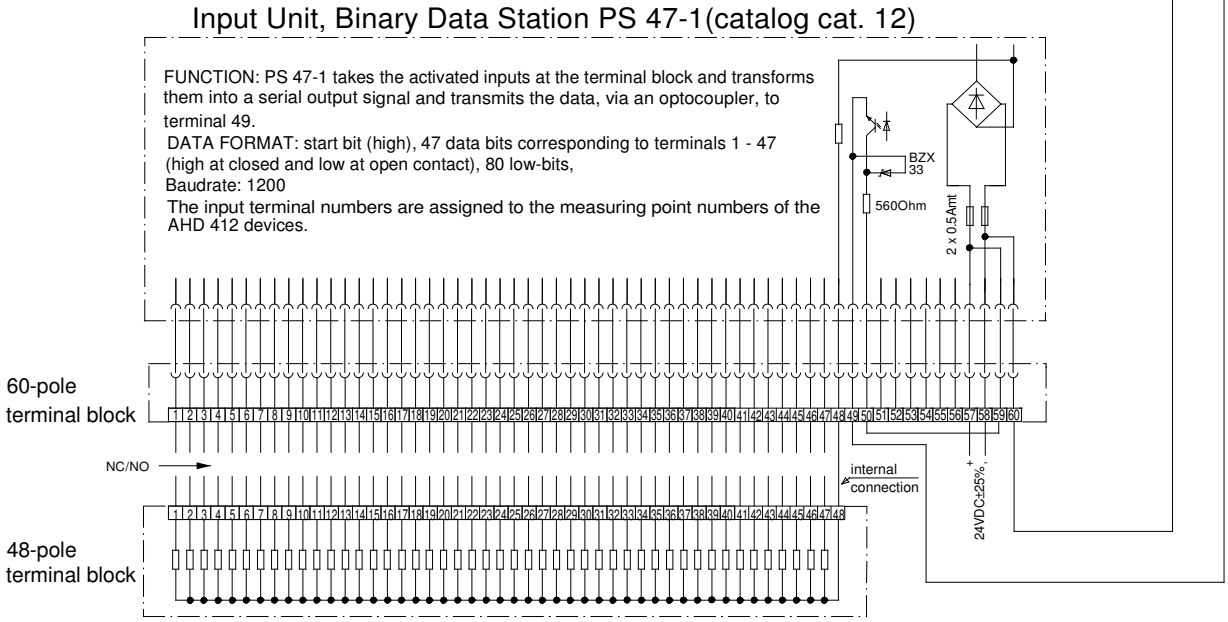
Function

The inputs at binary data station PS47-1 are transformed into a serial output signal and transmitted to the output unit AHD 412. AHD 412 then transforms the serial signal into parallel outputs. Therefore, if, the input at terminal 16 is closed, also the output at terminal 16 connects through.

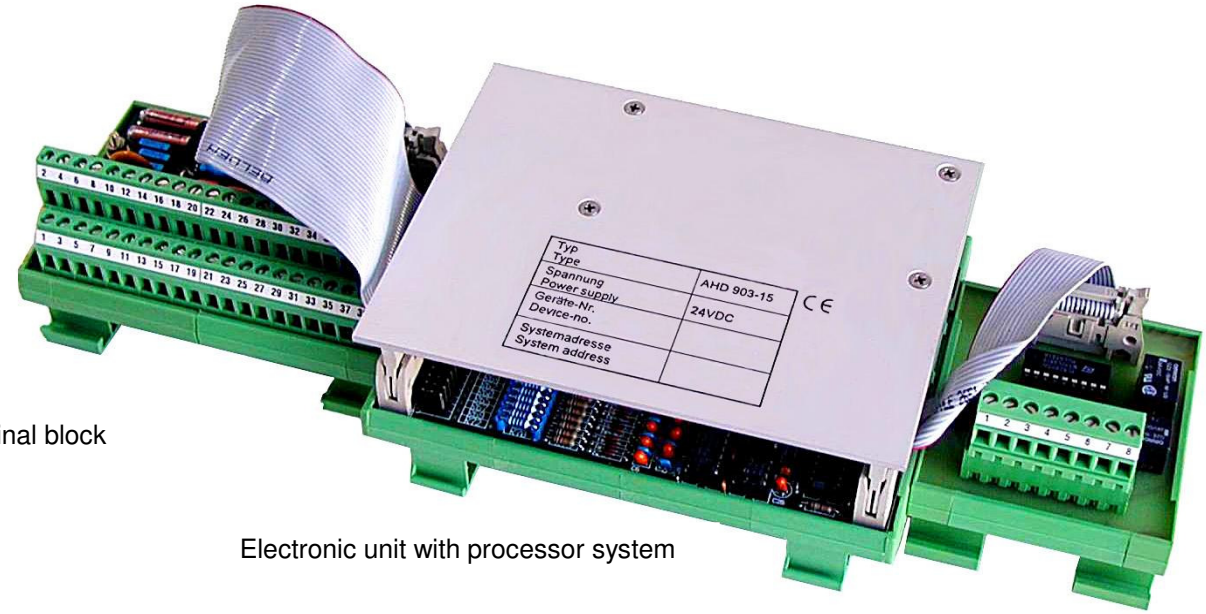
Unlike shown in the example, the input circuits do not have to be done bipolar. In case of unipolar connection, the 48-pole terminal block remains unused. The mutual reference terminal is then connected with supply-minus. Mixed connections are also permitted. Besides mechanical switches, transistor outputs, as they are often found in level- or proximity-switches, can also be used as input circuits.

The cable for serial data transfer can be up to 1,000 meters long. In case there are strong magnetic fields in the vicinity, the wires must be twisted and commonly screened. The minimum diameter must be 0.75mm²

Input Unit, Binary Data Station PS 47-1(catalog cat. 12)



Analogue data station AHD 903-15
with
relay unit AHD 903R



Terminal block

Electronic unit with processor system

Relay unit AHD 903R

- analogue precision data station with 12-bit resolution
- 15 analogue inputs for Pt 100, Pt 1000, 0 (4) - 20 mA, 0 (2) - 10 V, binary, other kinds on request
- 1 serial bi-directional interface
- 1 serial output for direct connection with the Kompakt EDA 47 alarm system or data distributor AHD W
- up to 16 devices can be connected with the LDC monitor AHD 524 via a 2-wire bus-system (plus power supply), see catalogue Section 6.
- mountable on rails (TS 32, TS 35)
- type approved by ABS, BV, DNV, GL, LR

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

Analogue data station AHD 903-15

1. Introduction

AHD 903-15 is a microprocessor controlled device that is mainly used for decentralized data registration. Because the systems can be individually addressed it is possible to connect up to 16 data stations (240 inputs), spatially separated via a bus with 4 connections (incl. power supply). The LCD-Monitor AHD524 calls up the stations one after the other and displays the data in graphical or tabular form on different pages. Due to a large amount of software variations the following problems can be addressed:

- general analogue and binary data registration with alarm function
- exhaust-gas average temperature monitoring for diesel engines
- tank content levels for tanks of all shapes
- earth contact monitoring of electric engines

2. Assembly

AHD 903-15 consists of an electronic card that is inserted in a housing for rail installation. It is connected with a 40-pole transfer unit via ribbon cable for connection of all inputs and outputs as well as of the power supply.

The device passed a vibration test of 4 G during the classification procedure and is thus also approved for direct installation into terminal boxes and diesel engines.

3. Data collection

Up to 15 measuring sensors can be connected 1- or 2-poled to one analogue data station. The recorded values are normed internally, converted and transmitted to the display unit AHD 524 as numeric values. Furthermore, upper and lower limit values can be programmed. An alarm is triggered in the event the measured values are out of this range. These limit values are available serially at a dedicated data output (terminal 4). From there, they can be transmitted to, e.g., a monitoring device which triggers an in the event the measured values are out of range.

In case the system is linked to display unit AHD 524, it receives data requests or configuration parameters via a bi-directional bus connection, whereby multiple data stations are called up by different addresses. The data are sent back to the display unit AHD 524 via the same connection.

In addition to a monitoring circuit, the microprocessor-controlled system contains a special memory chip for permanent storage of configuration data (limit values, input mode, range limits, etc.). The collection of measured values is carried out by a 12-bit A/D converter system. An integrated reference compensation, as well as signal filtering at the inputs, enables extremely accurate measuring results.

The following inputs can be processed:

- 0...10V/1...10V
- 0...20mA/4...20mA
- PT100
- PT1000
- binary units

Others on request

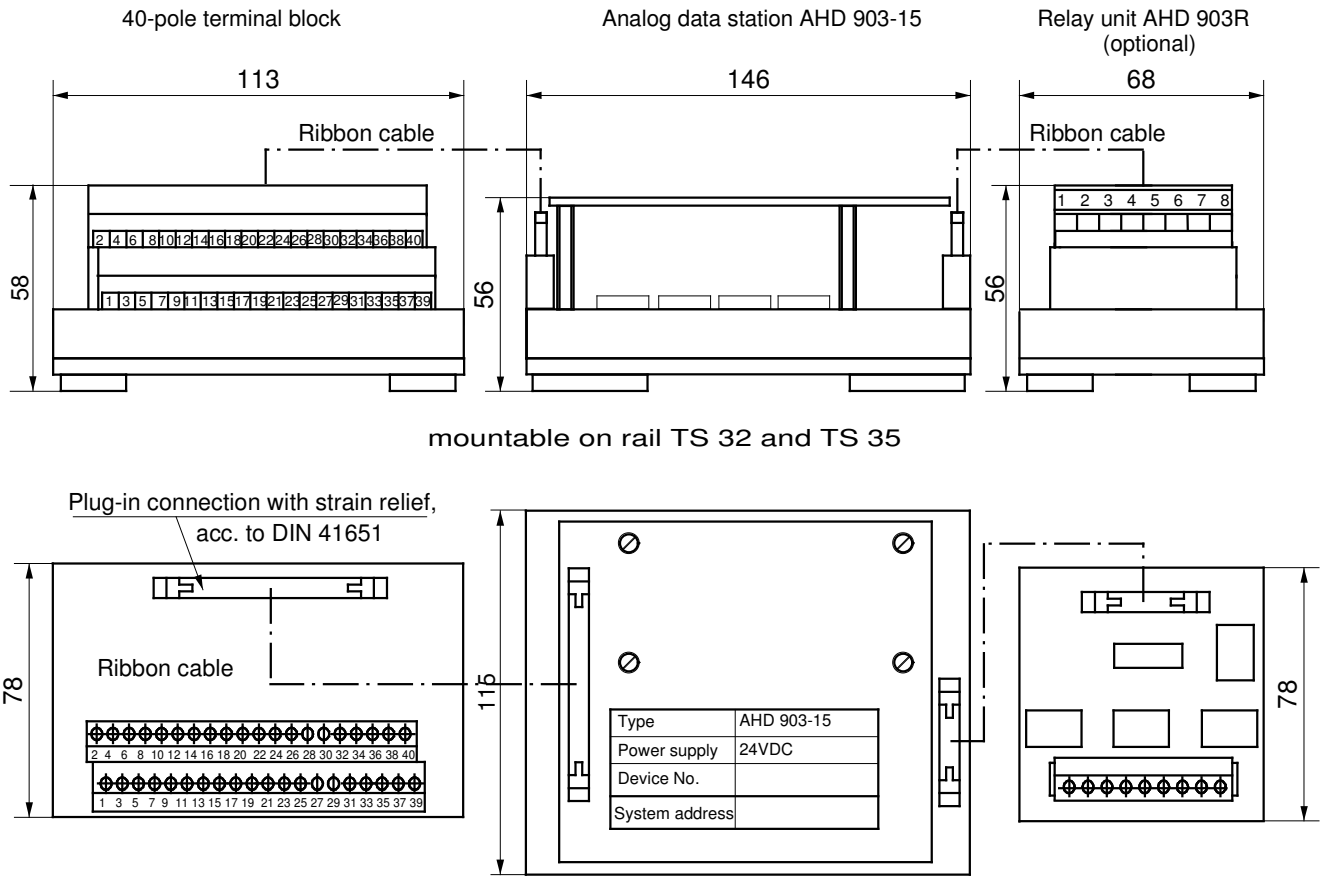
A relay station (AHD 903R) with four relays can be connected via ribbon cable. In the event of a limit value being reached, the relay belonging to the corresponding group of inputs is activated. Each input can be freely assigned to one of these four groups. The relays can be programmed as initial-value or new-value indicators and either as NO or NC.

The basis for configuration and programming ex-works is the measuring point list filled in by the customer.

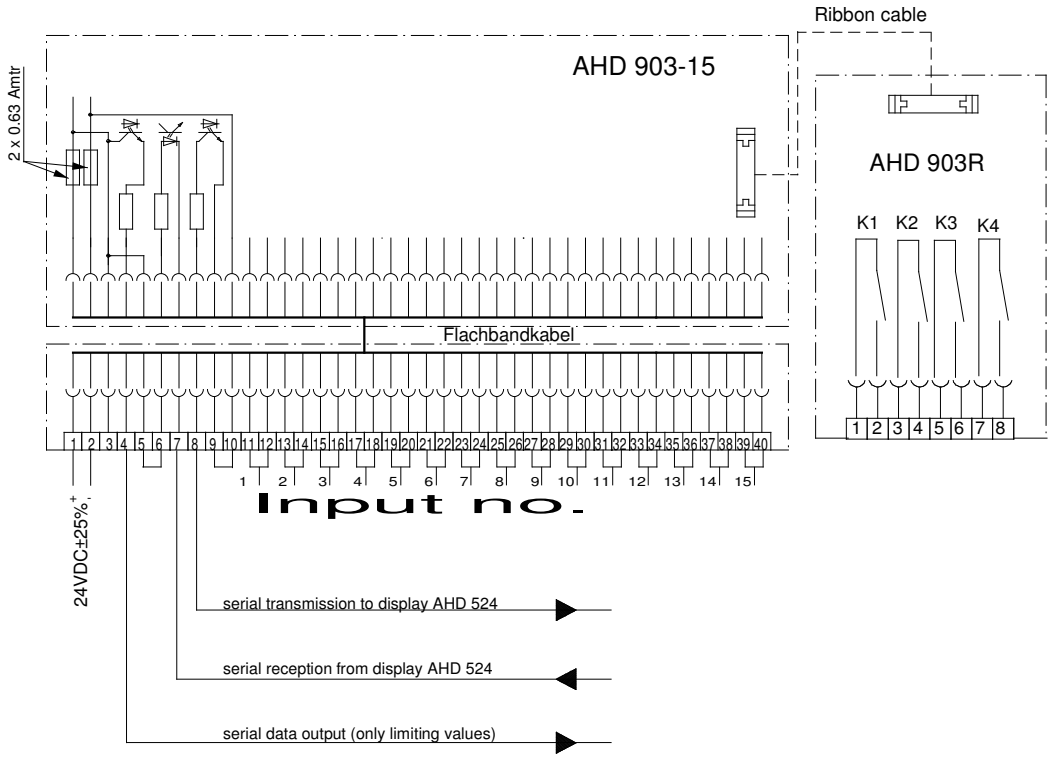
More detailed documentation for this device can be provided on request.

DIMENSIONAL DRAWING

903-1-b.mcd



TERMINAL DIAGRAM



TECHNICAL DATA AHD 903-15

Power supply	: 24VDC ± 25%
Power consumpt. of electronics	: app. 0.15 A
Number of inputs	: 15
Type of input	: Pt100, Pt1000, 0(4)-20mA, 0(1)-10V
Input resolution	: 12 bits
Permissible rel. air humidity	: 99%
Protection class	: IP 00
Weight	: 0.5 Kg

TECHNICAL DATA AHD 903R

Number of relays	: 4
Permissible load of relays	: 1 A
Permissible voltage of relays	: 50VDC C
Permissible rel. air humidity	: 99%
Protection class	: IP 00
Weight	: 01 Kg

must34-e

MEASURING POINT LIST

MEASURING POINT LIST FOR ANALOGUE STATION AHD 903-15

INPUT MODE (please mark applying)

Independent of suppressions in the COMPACT EDA 47, in the analogue station, each measuring point can be suppressed by any other.

DATA FOR THE ALARM SYSTEM (1 to 5 possible (also multiple); e. g. EDA Nr.2; e. g. 38)

Input no.	Marking of measuring point	Pt100	Pt1000	① 0-10V	① 1-10V	① 0-20mA	① 4-20mA	Contact (NC) (Opener)	Contact (NO) (Closer)	other	Measuring range	Unit	Lim. value min (falling sign.)	Lim. value max (rising sign.)	Delay On (1-999s)	Delay Off (1-999s)	Suppression by input of this U-station	Group relay (k1 - k4)	Suppression by dest. system meas. point no.	Group relay	dest.system	Meas.Point no. of dest. system	Group (Bridge)	Group (Clamber)	Print ?	LED-Color in the alarm system (red, yellow, green)
1																										
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										
13																										
14																										
15																										

(Only if group relay unit AHD 903R is part of delivery)

GROUP RELAY DEFINITION	K1	K2	K3	K4
First value indicator				
New value indicator				
Contact normally open				
Contact normally closed				

① Please mark, in case of transformers with current- or voltage-output-signal, whether it has a 2, 3 or 4-conductor technic.

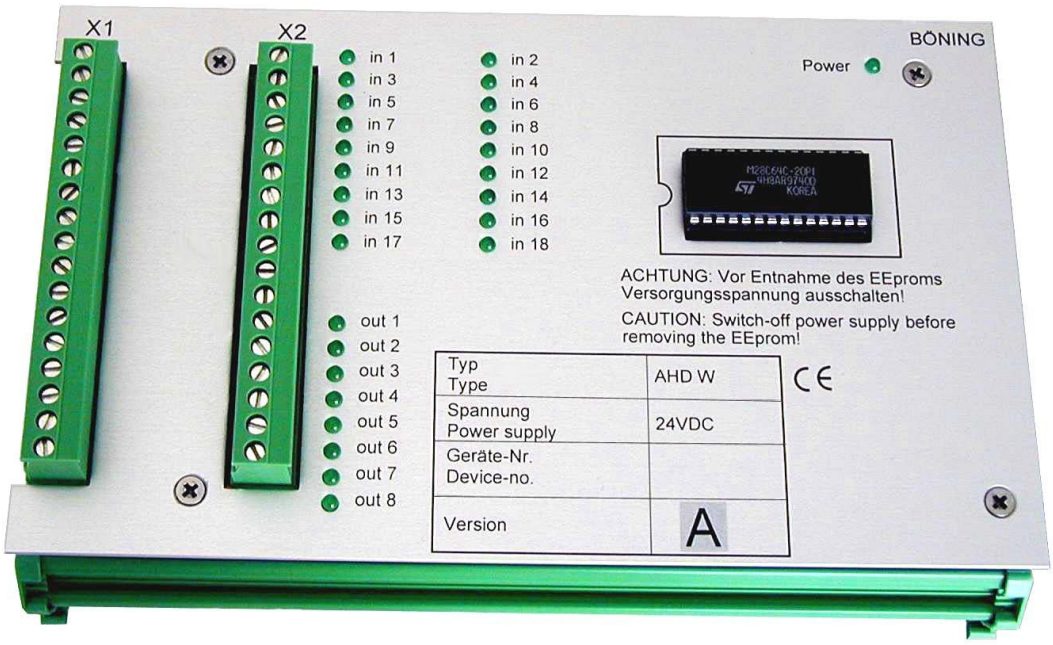
Client	
Shipyard	
Newbuilding	

Analogue station .....

Substation-no. U.....

Date: .....

DATA DISTRIBUTOR AHD W
(Version A)



The data distributor is used, e.g., in decentralized fault report systems for collection of serial data from substations. It is also used in ballast-pumping systems on ships where limit switch positions are monitored, or magnetic valves have to be addressed.

The device can deal with 270 reports from 18 data stations or AHD 414/AHD 414A (contacts, analogue limit values or status information), sort them in a programmable way and transmit them via serial bus to as many as 8 alarm systems Type KOMPAKT EDA 47. Each single report can be assigned to any one of 376 destination devices. Serial communication is indicated by LEDs at the inputs and outputs. The considerable cost savings due to minimization of wiring frequently exceed the price of the devices.

- pluggable terminal blocks
- mountable on rails TS32 or TS35
- GL classification

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

DATA DISTRIBUTOR AHD W, VERSION A

CONTENTS

		PAGE
1.	Introduction	3
2	Function	3
Dimensional drawing		6
Technical data		6
Terminal diagram		7
Programming table		8
Specimen case graphic		9

1. Introduction

AHD W (Version A) is a microprocessor-controlled device for collection of serial data and freely programmable distribution via serial bus. The device incorporates an electronic card that is installed in a rail-mounted housing (TS32 or TS35). All inputs and outputs are led to two pluggable terminal blocks.

There is an EEprom 28C64 on the electronic card that contains a system program and free memory space for project-specific programming. It can be removed (power switched off) and programmed according to the programming table on page 8. We recommend our portable programming device S4.

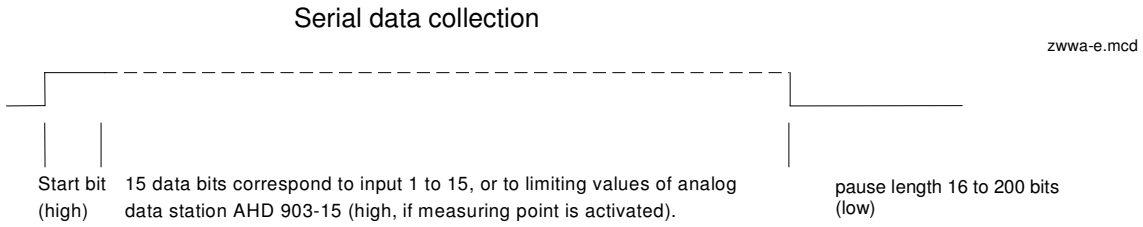
2. Function

AHD W (A) has 19 power-controlled serial optocoupler inputs and 10 serial transistor outputs. At the inputs 1 to 18, it can receive the 15 inputs of one substation PS 47-1-15, or status reports (reached analog limiting values) of the Aanalog Data Station AHD 903-15 by means of a single wire each. Other devices, e.g. the Diesel-Start-Stop-Automatic AHD 414 or the Safety and Alarm System AHD 414A, can also be linked up. Attached to this handbook there is a drawing of decentralized failure report system, where the function of the data distributor is described.

Further details of the above mentioned input devices can be found in the specifications of:

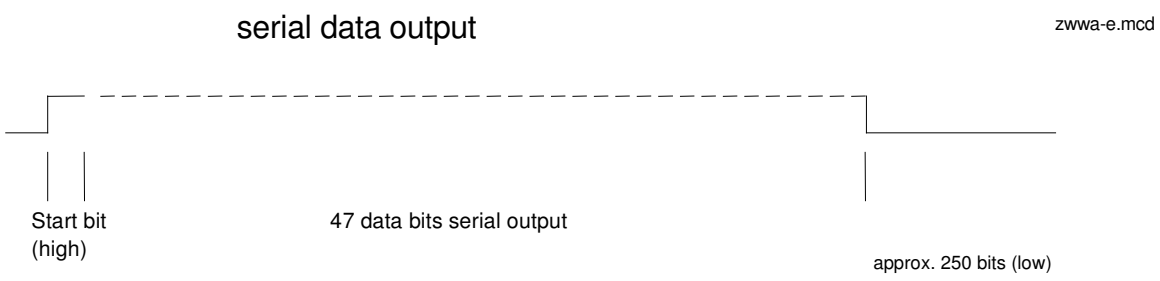
Binary Data Station:	PS 47-1-15
Analog Data Station:	AHD 903-15
Diesel-Start-Stop-Automatic:	AHD 414
Safety System:	AHD 414A

Data registration is carried out according to the following drawing:



Data rate is 1200 baud.

Thus, the data distributor can log up to 18 x 15 = 270 inputs. In case of failure of the serial data transmission, the data distributor activates the '16th input'. Monitoring of the substations is also carried out by the data distributor. All inputs, including the information 'Data Failure', can be arbitrarily assigned to the 8 serial outputs. The serial output signal is as follows:



Data rate is 1200 baud.

With the programming table on page 8, all input bits can be assigned to all output bits. Thus, there are 8 x 47 = 376 destinations available for the 270 input bits, as well as for the 18 bits for 'Data Failure'. There are also 270 additional input bits available for 'Sensor Failure', in the event that analogue data stations AHD 903-15 are connected as entry devices. The programming tables of the data distributor contain information about its mode of input:

Input mode 00	serial input is vacant
Input mode 01	Binary data station PS 47-1-15, analogue data station AHD 903-15 without sensor failure monitoring, Diesel start automatic AHD 414, safety and alarm system AHD 414A
Input mode 02	Analogue data station AHD 903-15 with sensor failure monitoring

Thus, data distributor AHD W (Version A) enables decentralized logging of data and can considerably reduce wiring and the related expenses. At the same time, an input does not have a fixed, but an arbitrarily programmable output. Possible destination systems are, e.g., the alarm and display system KOMPAKT EDA 47 or the module AHD 412 that can be used e.g. for direct activation of magnetic valves.

Thus, by means of the programming table the user can specify that, e.g., substation no. 5 (connected to terminal no. 5 on the data distributor) is to address measuring point no. 32 of the KOMPAKT EDA 47 device that is connected to the serial output no. 4. An 'Or-Operation' is made possible by multiple addressing of an output. That means that if the measuring point input in the destination system is programmed to be connected to a 'NO' switch (closer), it can be activated from different points. If it is to function as a 'NC' switch (opener), it can only be activated when no other relevant output-bit is received from substations.

In case fewer than 18 substations are connected up, some serial inputs will be left unoccupied. These can subsequently be switched parallel to connected inputs. Thus, a multiple use of the same inputs for different destinations is possible.

Sensor failure

As described above, the data distributor can also log and analyze sensor failures at the inputs of the analogue data station. Each sensor failure can be allocated to any one of the 376 destinations. At the same time the original destination assigned to this input will be activated.

Example:

Input no. 5 of the analogue data station AHD 903-15 that is connected to serial input no. 12, is programmed in a way that it addresses the 36th bit of serial output no. 4. At the same time, in case of sensor failure, the 28th bit of serial output no. 7 should also be activated.

Programming according to the table on page 5

EEprom-Address	Content	
1168	04	
1169	36	
1468	07	
1469	28	
160B	02	(mode of input)

Usually, the 28th bit (in this example) of serial output no. 7 functions as collective report. Therefore, it is deleted for approx. 2 s following each sensor failure before being reset. An alarm that has already been acknowledged but is still active, extinguishes and is then reactivated (collective alarm repetition).

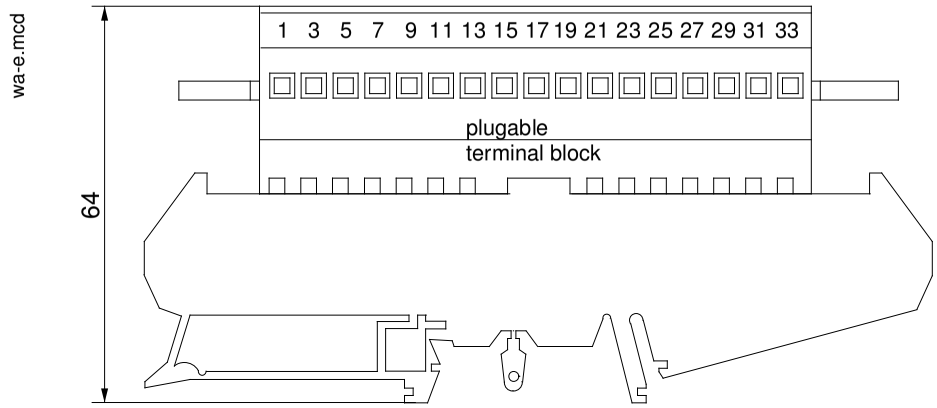
Input chann. no. 12 = terminal no						Content
Type of input in address 160B						.....
		Active report			Sensor-failure	
Input	Address	Target system	Measur. point no.	Address	Target system	Measur. point no.
1	1160			1460		
2	1162			1462		
3	1164			1464		
4	1166			1466		
5	1168			1468		
6	116A			146A		
7	116C			146C		
8	116E			146E		
9	1170			1470		
10	1172			1472		
11	1174			1474		
12	1176			1476		
13	1178			1478		
14	117A			147A		
15	117C			147C		
(16)	117E			-----		

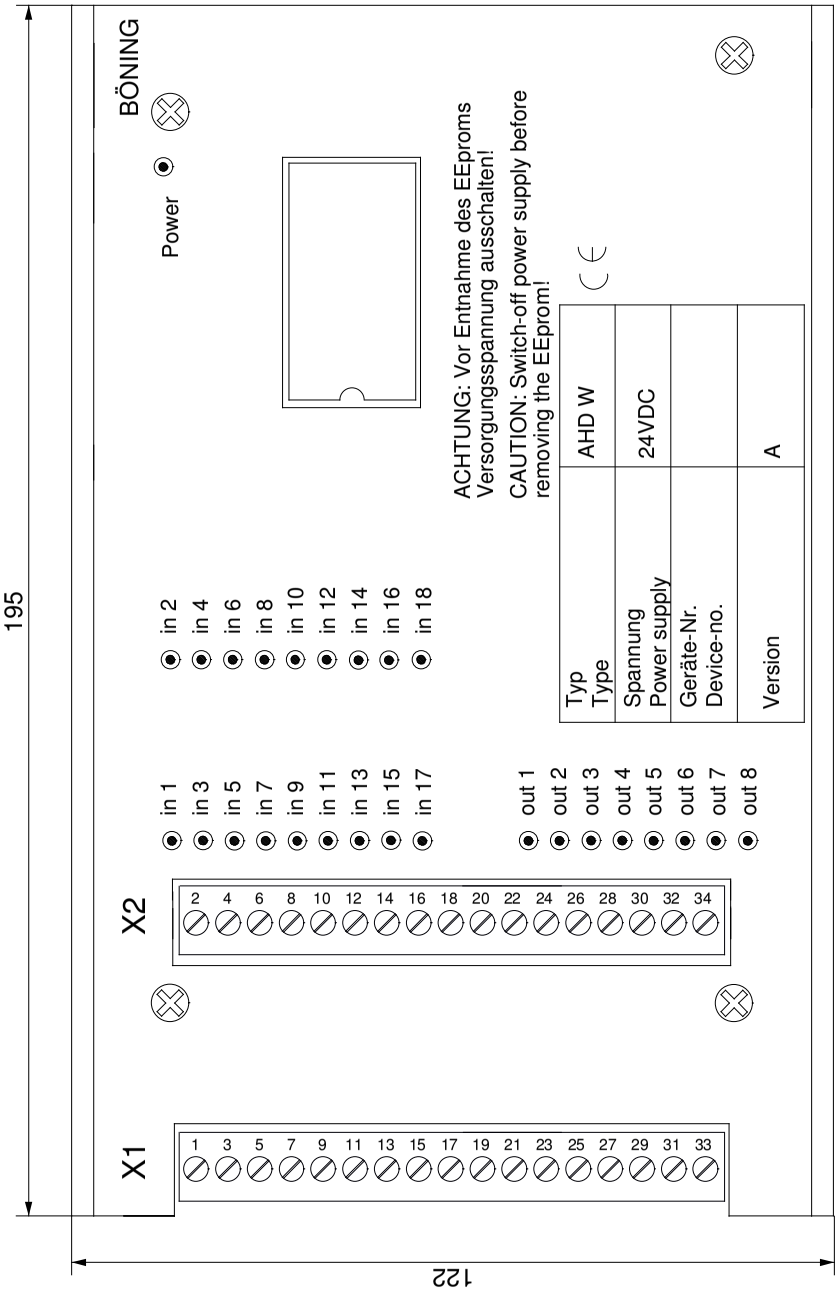
Programming table for serial input no.12 (see page 9 of this description). The address 160B has the content 02 for the respective mode of input (analogue data station AHD 903-15 with sensor failure monitoring).

Failure substation

In case of failure of a substation, wire break or interruption of the power supply to a substation, all serial data is also interrupted. As result of this the data distributor sets the '16th' input bit that can also be assigned arbitrarily programmable to all serial outputs

DIMENSIONAL DRAWING

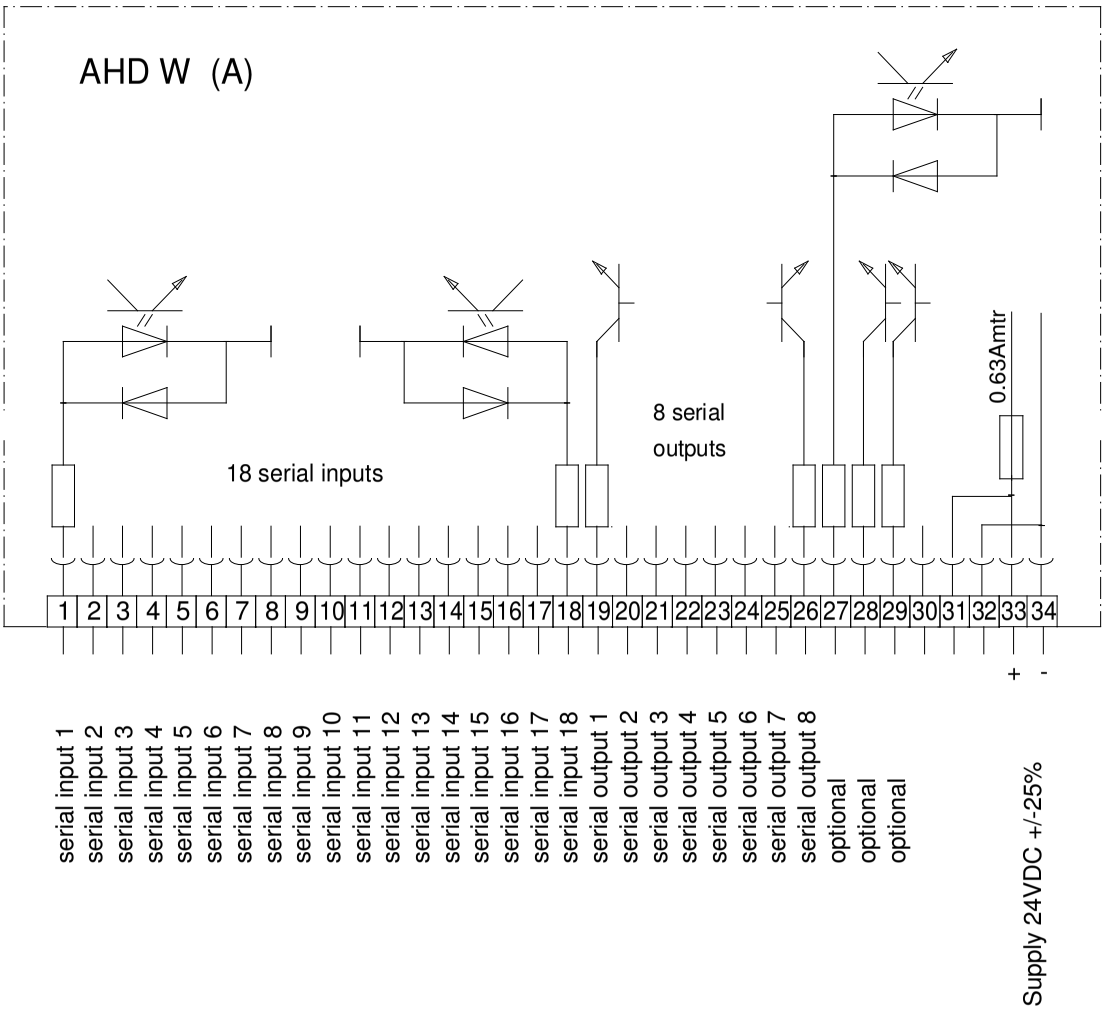




TECHNICAL DATA

Power supply	: 24 VDC +/- 25 %
Power consumpt. of the electronics	: app. 0.2 A
Degree of protection	: IP 00
Weight	: 0.7kg
Inputs/Outputs	: 19 x serial input 10 x serial output
Baud rate	: 1200 Baud (or on request)

Terminal diagram



Programming Chart for Data Distributor AHD W (A)

Client: Yard: Newbuilding:

Com.-no.: 4- Last update:

wa4-e.mod

Type of input: 00 = input idle
01 = Binary Station PS 47-1-15, Analog Station AHD 903-15 without sensor failure supervision, alarm-/safety-system AHD 414A or Diesel-Start-Automatic AHD 414
02 = Analog Station AHD 903-15 with sensor failure supervision

Input-(16) is created internally in case of "Failure Data Station".

Input chann. no. 1 = terminal no. | Content .....
Type of input in address 1600 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1000			1300		
2	1002			1302		
3	1004			1304		
4	1006			1306		
5	1008			1308		
6	100A			130A		
7	100C			130C		
8	100E			130E		
9	1010			1310		
10	1012			1312		
11	1014			1314		
12	1016			1316		
13	1018			1318		
14	101A			131A		
15	101C			131C		
(16)	101E			-----		

Input chann. no. 2 = terminal no. | Content .....
Type of input in address 1601 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1020			1320		
2	1022			1322		
3	1024			1324		
4	1026			1326		
5	1028			1328		
6	102A			132A		
7	102C			132C		
8	102E			132E		
9	1030			1330		
10	1032			1332		
11	1034			1334		
12	1036			1336		
13	1038			1338		
14	103A			133A		
15	103C			133C		
(16)	103E			-----		

Input chann. no. 3 = terminal no. | Content .....
Type of input in address 1602 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1040			1340		
2	1042			1342		
3	1044			1344		
4	1046			1346		
5	1048			1348		
6	104A			134A		
7	104C			134C		
8	104E			134E		
9	1050			1350		
10	1052			1352		
11	1054			1354		
12	1056			1356		
13	1058			1358		
14	105A			135A		
15	105C			135C		
(16)	105E			-----		

Input chann. no. 4 = terminal no. | Content .....
Type of input in address 1603 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1060			1360		
2	1062			1362		
3	1064			1364		
4	1066			1366		
5	1068			1368		
6	106A			136A		
7	106C			136C		
8	106E			136E		
9	1070			1370		
10	1072			1372		
11	1074			1374		
12	1076			1376		
13	1078			1378		
14	107A			137A		
15	107C			137C		
(16)	107E			-----		

Input chann. no. 5 = terminal no. | Content .....
Type of input in address 1604 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1080			1380		
2	1082			1382		
3	1084			1384		
4	1086			1386		
5	1088			1388		
6	108A			138A		
7	108C			138C		
8	108E			138E		
9	1090			1390		
10	1092			1392		
11	1094			1394		
12	1096			1396		
13	1098			1398		
14	109A			139A		
15	109C			139C		
(16)	109E			-----		

Input chann. no. 6 = terminal no. | Content .....
Type of input in address 1605 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	10A0			13A0		
2	10A2			13A2		
3	10A4			13A4		
4	10A6			13A6		
5	10A8			13A8		
6	10AA			13AA		
7	10AC			13AC		
8	10AE			13AE		
9	10B0			13B0		
10	10B2			13B2		
11	10B4			13B4		
12	10B6			13B6		
13	10B8			13B8		
14	10BA			13BA		
15	10BC			13BC		
(16)	10BE			-----		

Input chann. no. 7 = terminal no. | Content .....
Type of input in address 1606 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	10C0			13C0		
2	10C2			13C2		
3	10C4			13C4		
4	10C6			13C6		
5	10C8			13C8		
6	10CA			13CA		
7	10CC			13CC		
8	10CE			13CE		
9	10D0			13D0		
10	10D2			13D2		
11	10D4			13D4		
12	10D6			13D6		
13	10D8			13D8		
14	10DA			13DA		
15	10DC			13DC		
(16)	10DE			-----		

Input chann. no. 8 = terminal no. | Content .....
Type of input in address 1607 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	10E0			13E0		
2	10E2			13E2		
3	10E4			13E4		
4	10E6			13E6		
5	10E8			13E8		
6	10EA			13EA		
7	10EC			13EC		
8	10EE			13EE		
9	10F0			13F0		
10	10F2			13F2		
11	10F4			13F4		
12	10F6			13F6		
13	10F8			13F8		
14	10FA			13FA		
15	10FC			13FC		
(16)	10FE			-----		

Input chann. no. 9 = terminal no. | Content .....
Type of input in address 1608 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1100			1400		
2	1102			1402		
3	1104			1404		
4	1106			1406		
5	1108			1408		
6	110A			140A		
7	110C			140C		
8	110E			140E		
9	1110			1410		
10	1112			1412		
11	1114			1414		
12	1116			1416		
13	1118			1418		
14	111A			141A		
15	111C			141C		
(16)	111E			-----		

Input chann. no. 10 = terminal no. | Content .....
Type of input in address 1609 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1120			1420		
2	1122			1422		
3	1124			1424		
4	1126			1426		
5	1128			1428		
6	112A			142A		
7	112C			142C		
8	112E			142E		
9	1130			1430		
10	1132			1432		
11	1134			1434		
12	1136			1436		
13	1138			1438		
14	113A			143A		
15	113C			143C		
(16)	113E			-----		

Input chann. no. 11 = terminal no. | Content .....
Type of input in address 160A .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1140			1440		
2	1142			1442		
3	1144			1444		
4	1146			1446		
5	1148			1448		
6	114A			144A		
7	114C			144C		
8	114E			144E		
9	1150			1450		
10	1152			1452		
11	1154			1454		
12	1156			1456		
13	1158			1458		
14	115A			145A		
15	115C			145C		
(16)	115E			-----		

Input chann. no. 12 = terminal no. | Content .....
Type of input in address 160B .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1160			1460		
2	1162			1462		
3	1164			1464		
4	1166			1466		
5	1168			1468		
6	116A			146A		
7	116C			146C		
8	116E			146E		
9	1170			1470		
10	1172			1472		
11	1174			1474		
12	1176			1476		
13	1178			1478		
14	117A			147A		
15	117C			147C		
(16)	117E			-----		

Input chann. no. 13 = terminal no. | Content .....
Type of input in address 160C .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1180			1480		
2	1182			1482		
3	1184			1484		
4	1186			1486		
5	1188			1488		
6	118A			148A		
7	118C			148C		
8	118E			148E		
9	1190			1490		
10	1192			1492		
11	1194			1494		
12	1196			1496		
13	1198			1498		
14	119A			149A		
15	119C			149C		
(16)	119E			-----		

Input chann. no. 14 = terminal no. | Content .....
Type of input in address 160D .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	11A0			14A0		
2	11A2			14A2		
3	11A4			14A4		
4	11A6			14A6		
5	11A8			14A8		
6	11AA			14AA		
7	11AC			14AC		
8	11AE			14AE		
9	11B0			14B0		
10	11B2			14B2		
11	11B4			14B4		
12	11B6			14B6		
13	11B8			14B8		
14	11BA			14BA		
15	11BC			14BC		
(16)	11BE			-----		

Input chann. no. 15 = terminal no. | Content .....
Type of input in address 160E .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	11C0			14C0		
2	11C2			14C2		
3	11C4			14C4		
4	11C6			14C6		
5	11C8			14C8		
6	11CA			14CA		
7	11CC			14CC		
8	11CE			14CE		
9	11D0			14C0		
10	11D2			14D2		
11	11D4			14D4		
12	11D6			14D6		
13	11D8			14D8		
14	11DA			14DA		
15	11DC			14DC		
(16)	11DE			-----		

Input chann. no. 16 = terminal no. | Content .....
Type of input in address 160F .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	11E0			14E0		
2	11E2			14E2		
3	11E4			14E4		
4	11E6			14E6		
5	11E8			14E8		
6	11EA			14EA		
7	11EC			14EC		
8	11EE			14EE		
9	11F0			14F0		
10	11F2			14F2		
11	11F4			14F4		
12	11F6			14F6		
13	11F8			14F8		
14	11FA			14FA		
15	11FC			14FC		
(16)	11FE			-----		

Input chann. no. 17 = terminal no. | Content .....
Type of input in address 1610 .....

Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1200			1500		
2	1202			1502		
3	1204			1504		
4	1206			1506		
5	1208			1508		
6	120A			150A		
7	120C			150C		
8	120E			150E		
9	1210			1510		
10	1212			1512		
11	1214			1514		
12	1216			1516		
13	1218			1518		
14	121A			151A		
15	121C			151C		
(16)	121E			-----		

Input chann. no. 18 = terminal no. | Content .....
Type of input in address 1611 .....

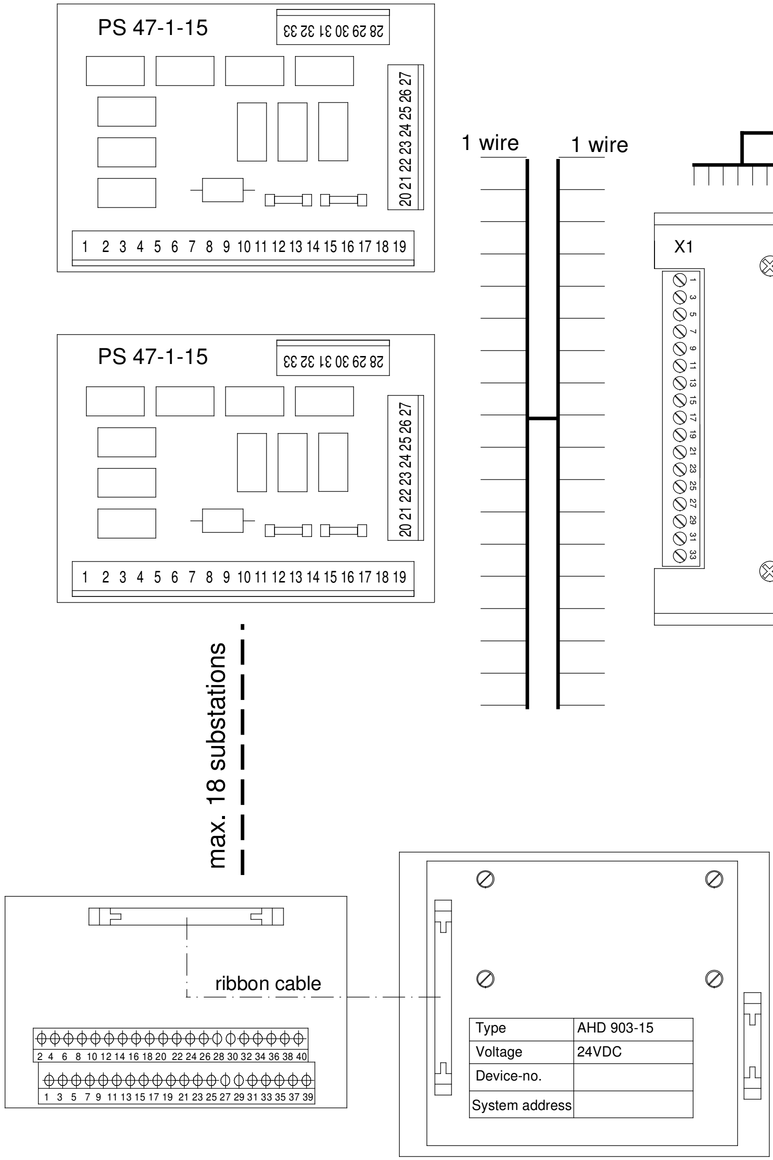
Input	Address	Active report: Target system	Active report: Measur. point no.	Address	Sensor-failure: Target system	Sensor-failure: Measur. point no.
1	1220			1520		
2	1222			1522		
3	1224			1524		
4	1226			1526		
5	1228			1528		
6	122A			152A		
7	122C			152C		
8	122E			152E		
9	1230			1530		
10	1232			1532		
11	1234			1534		
12	1236			1536		
13	1238			1538		
14	123A			153A		
15	123C			153C		
(16)	123E			-----		

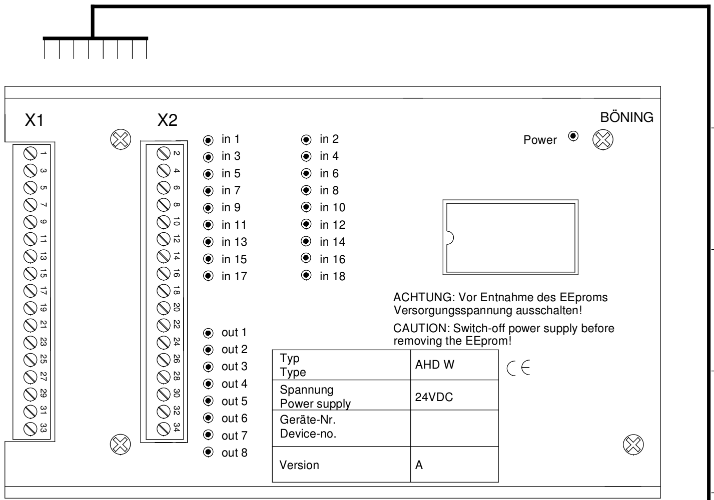
DECENTRALIZED DATA REGISTRATION AND DISPLAY

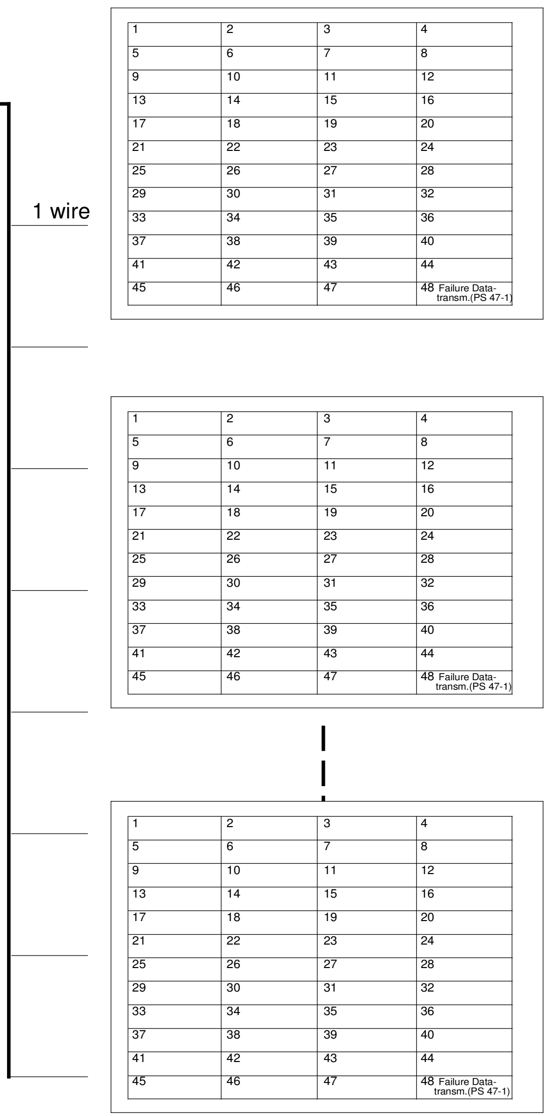
18 Binary Stations PS 47-1-15 or Analog Data Stations AHD 903-15 = 270 inputs

Data Distributor AHD W (A) for arbitrarily programmable assignment of the inputs to the measuring points of the KOMPAKT EDA 47-devices

8 KOMPAKT EDA 47 with a total of 376 measuring points as possible targets







BRIEF DESCRIPTION

The substations PS 47-1-15 transform binary data (contacts, transistor signals...) into a serial output signal and transmit them to data distributor A, which is usually installed in the ECR. Thus, the required cabling and space in the ECR-desk is reduced considerably. Instead of the Binary Data Stations, also Analog Data Stations AHD 903-15 can be used. Here, reached limiting values work like binary contacts.

The data stations (very small) are installed at geometrically convenient places. This could be, e.g., terminal boxes for connection of the sensors and transfer to the ECR over collective cables. Thus, one station can reduce the amount of required wires by 27. An adapter terminal block is not required which means that the sensor cables are connected directly with the substations. Usually, a ring line is the most favorable solution. One 20-pole cable is required for 18 substations. Then, the amount of necessary wires is reduced by one wire each per substation.

An engine terminal box is permitted as installation site.

DATA DISTRIBUTOR AHD W
(Version B)

- microprocessor controlled device for arbitrarily programmable data distribution
- minimized wiring enabled by decentralized system design
- can set up as many as 48 groups out of 564 serially registered reports, programmable on 4 serial outputs
- printer interface
- mountable on rails TS32 or TS35
- GL certified

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

DATA DISTRIBUTOR AHD W, VERSION B

CONTENTS

		PAGE
1.	Introduction	3
2.	Design	3
3.	Function	3
Dimensional drawing		5
Technical data		6
Terminal diagram		6

1. Introduction

AHD W (Version B) is a microprocessor controlled device for serial data collection and arbitrarily programmable distribution.

2. Design

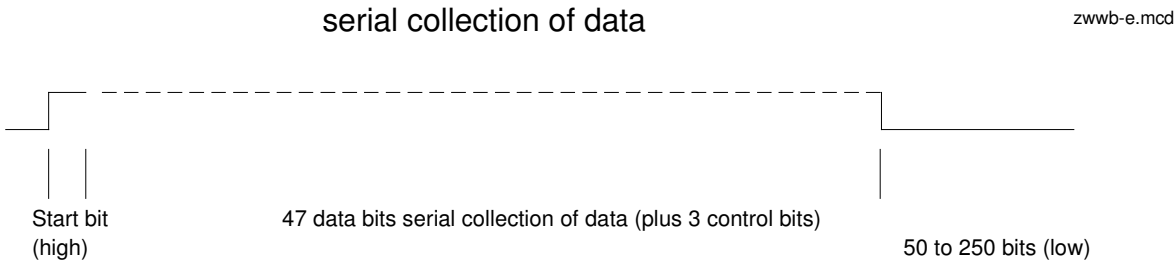
The device consists of an electronic card that is installed in a housing for mounting on rails TS32 or TS35. All inputs and outputs are led to two pluggable terminal blocks. The user has no need of additional terminal blocks.

There is an Eprom 27C256 on the electronic card that contains a system program and free memory space for project-specific programming. It can be removed (power switched off) and programmed according to the programming table. We recommend our portable programming device S4.

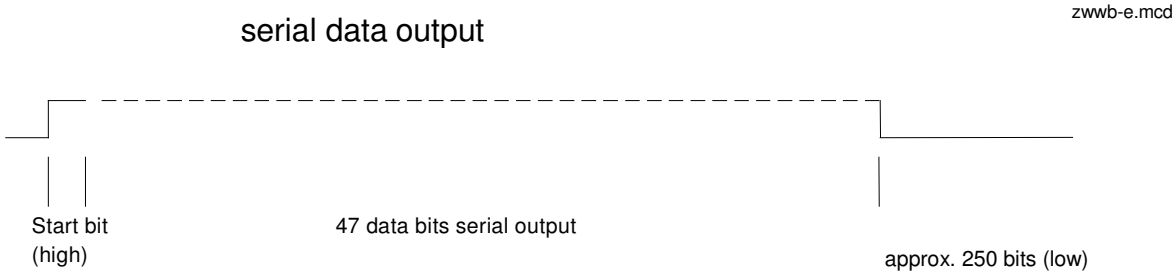
3. Function

AHD W (B) has 19 power-controlled serial optocoupler inputs and 10 serial transistor outputs. Like Data Distributor Version A (catalogue Section 14) that can receive data serially from the substations and assign them to arbitrarily programmable targets on other devices, Data Distributor Version B also has a distributor-function.

The device can, e.g. log, print and group the data from 12 alarm systems KOMPAKT EDA 47 via 12 serial inputs. Furthermore, it logs control-bits for alarm acknowledgement and transmits them, e.g., to the bridge and the engine rooms or mess.



Data rate is 1200 Baud.

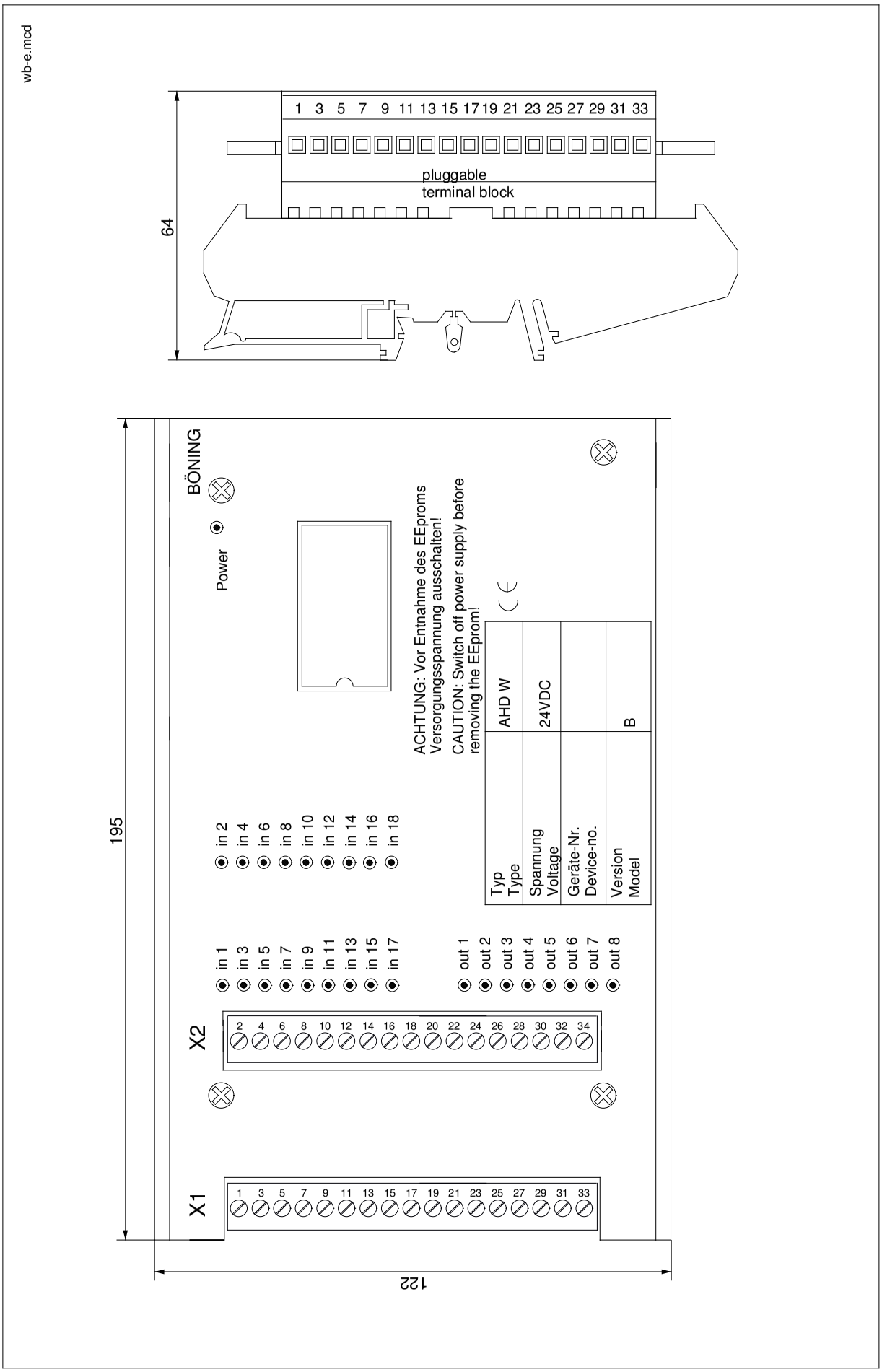


Data rate is 1200 Baud.

Data Distributor AHD W (Version B) also enables decentralized logging of data and can thus minimize wiring and related costs. The inputs have an arbitrarily programmable output. Possible destination systems are, e.g., the alarm and display system KOMPAKT EDA 47 (also as group panel), or the module AHD 412, that can be used for direct switching of magnetic valves.

Customers may request the programming table if it is not already included.

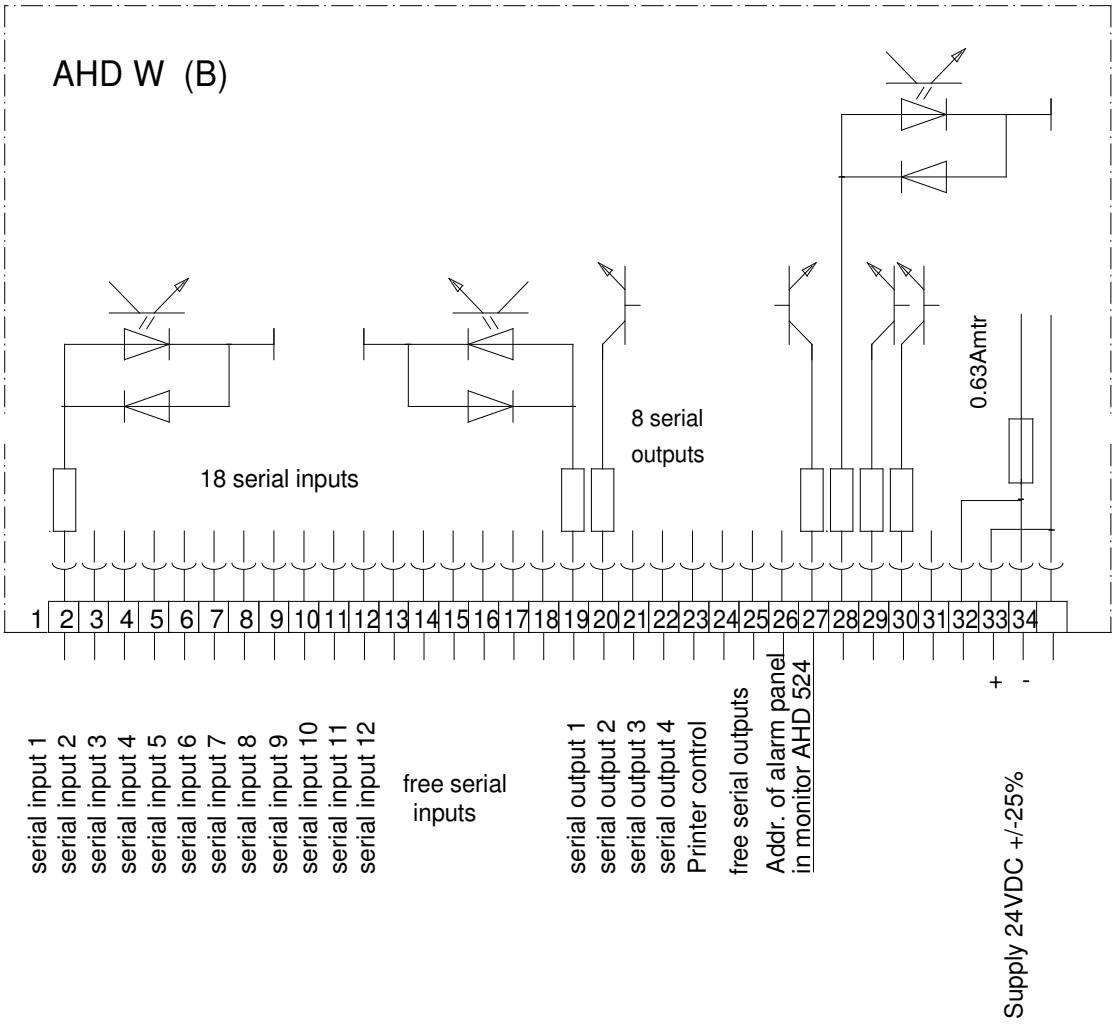
Dimensional drawing



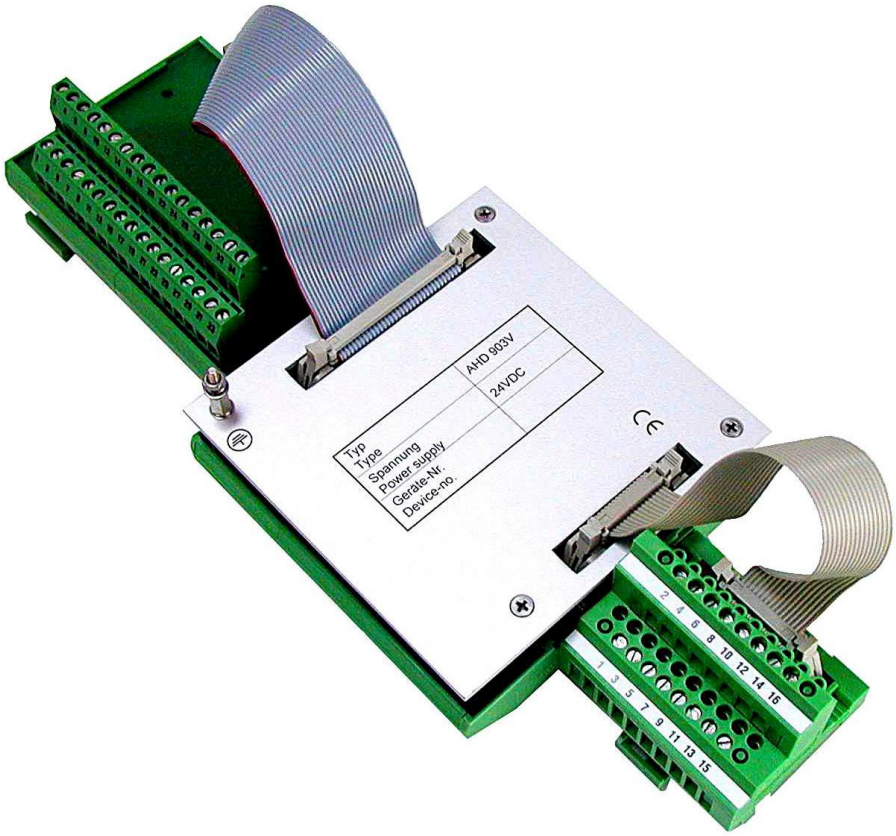
TECHNICAL DATA

Power supply	: 24 VDC +/- 25 %
Power consumpt. of the electronics	: app. 0.2 A
Degree of protection	: IP 00
Weight	: 0.7kg
Inputs/Outputs	: 19 x serial input 10 x serial output
Baudrate	: 1200 Baud (or upon request)

Terminal Diagram



AMPLIFIER FOR THERMOCOUPLERS NICRNI
AHD 903 V



- 14 precision amplifiers for thermocouplers NiCrNi, (or fewer on request) with amplification factor 101
- can be connected to Analogue Data Station AHD 903 -15 for exhaust gas average value monitoring of diesel engines
- modular design; all components have plug-in connections and can be mounted on rails
- GL certified

BÖNING Automationstechnologie

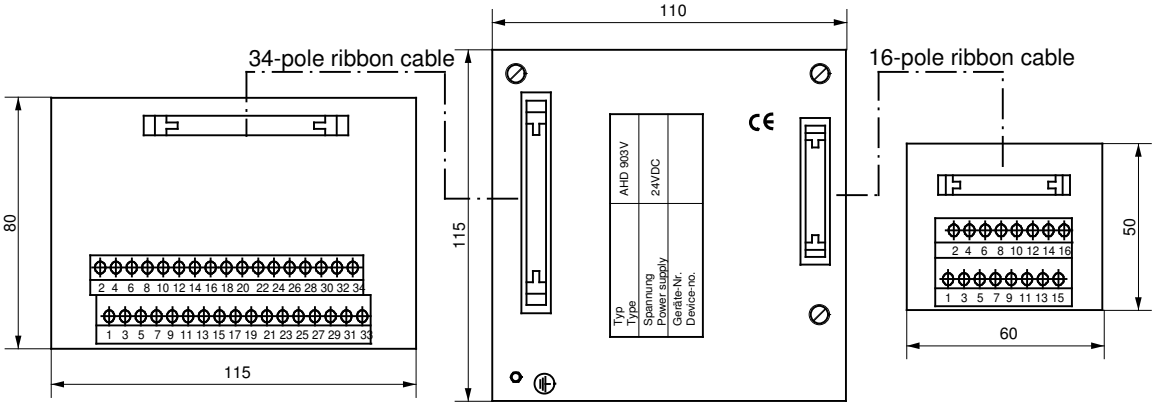
Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

903v-1-e.mcd

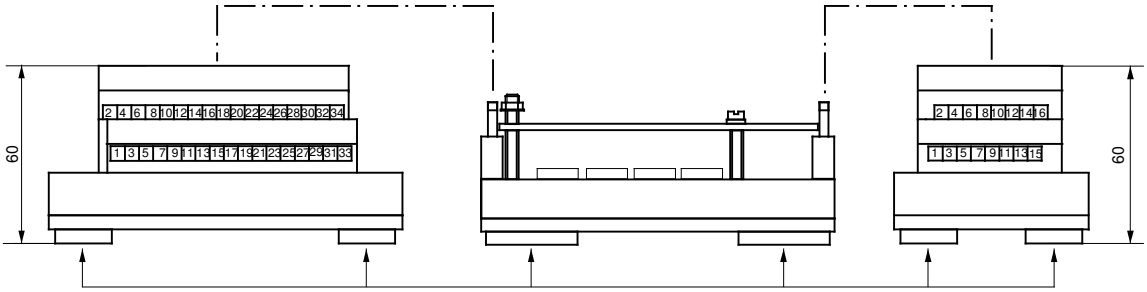
Thermocouple Amplifier AHD 903 V

All plug-in connections of the ribbon cables are equipped with strain relief acc. DIN 41651

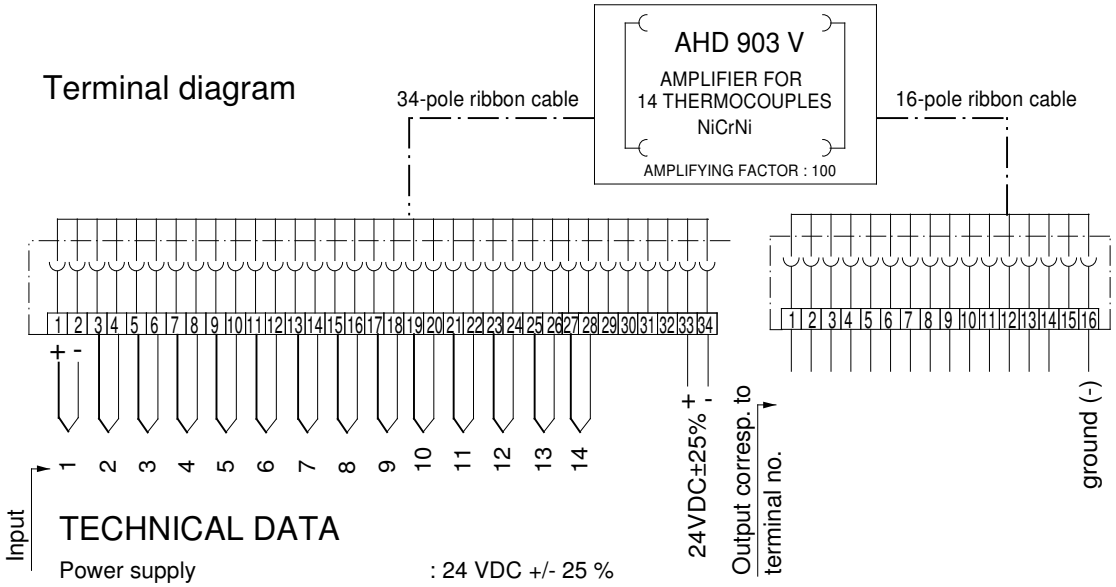
DIMENSIONAL DRAWING



Mountable on rails TS 32 and TS 35



Terminal diagram

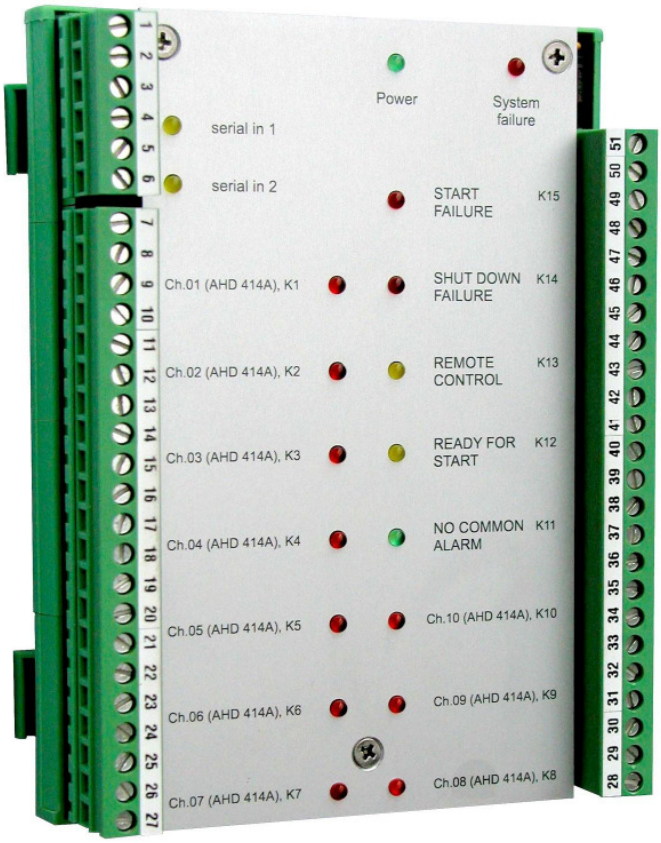


TECHNICAL DATA

Power supply	: 24 VDC +/- 25 %
Power cons. of the electronics	: app. 0.2 A
Inputs	: 14 x thermocoupler NiCrNi
Outputs	: 14 x 0 to 2.52V equivalent to app. 0 to 600°C, not compensated
Amplification	: 101
Weight	: 0.5 kg
Protection class	: IP 00
Perm. ambient temperature	: 0 to 70°C
Max. relative air humidity	: 99%

Relay Station with 15 Relays and Serial Control

Type AHD R101



- Minimization of wiring for spatially separated systems

- Parallel output of status reports that are available in serial format

- Can be used as measuring transducer with Data Station AHD 903-15

Date: 04.03.2009

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

CONTENTS

		Page
1	Introduction	3
2	Design	3
3	Function	3
4	Application-related specification for AHD-R101	4
5	Installation	5
5.1	Mounting	5
5.2	Wiring of the devices	5
6	Dimensional drawing with terminal diagram and technical data	6

Examples of application:

Parallel-serial conversion of binary units with parallel output	7
Parallel-serial conversion of analogue limit values with parallel output	8
Serial transmission of status reports from the Diesel-Start-Stop-Automatic AHD 414 with parallel output	9
Serial transmission of status reports from the Alarm and Safety System AHD 414A with parallel output	10

1 Introduction

The AHD-R101 Module is a microprocessor controlled device with 2 serial inputs and 15 relay outputs. It can be used for the following tasks:

- Reduction of wiring for spatially separated systems
- Parallel output of status reports that are available in serial format
- Can be used as measuring transducer with Data Station AHD 903-15

The following can be used as transmitting devices:

- Binary Data Station PS 47-1-15
- Analogue Data Station AHD 903-15
- Diesel-Start-Stop-Automatic AHD 414
- Alarm and Safety System AHD 414A

2 Design

AHD R101 comprises one electronic card containing the relays, which is installed in a plastic housing. All connections are established via 3 pluggable terminal blocks with a total of 51 terminals. The device is designed for mounting on rails TS 32 and TS35. The floating change-over contacts of each relay are led to the above mentioned terminal blocks.

3 Function

The Relay Station AHD R101 is available with various software versions. Some application examples are given at the end of this documentation. The form attached under 4, *„Application-Related Specification for AHD R101“* serves as template. It is filled in by the customer and provides the basis for software programming. Different functions are available on request.

The relay station can receive serial information (15 data bits per device) from up to 2 transmitters (e.g. the devices mentioned in section 1). The user can choose arbitrarily which information (data bit) shall be assigned to which relay. Furthermore, the user can determine individually for each relay, if its normal status shall be normally closed or open. If a relay is normally closed, it opens when at least one of the assigned data bits is activated.

In case a relay has not been assigned to any bit, and if it is normally closed, it is automatically assigned the function System Failure/Power Failure, which is important for many applications.

Several data bits can be assigned to the same relay. In this case, the input information will be OR-linked. The user can choose by configuration, if a relay shall function as first value indicator or new value indicator.

- In case of first value indication the relay switches, as soon as one of its assigned bits is activated. In case another bit is activated, this has no effect on the relay.

- In case of new value indication the relay switches to its normal status for approx. 3 seconds, starting at the second bit, before it switches to active status again. Thus, group or collective reports to, e.g., a superordinate alarm system are possible.

4 Application-Related Specification for AHD-R101

r101tab.mcd

APPLICATION RELATED SPECIFICATIONS FOR AHD R101

Order No.: .....

Device No.: .....

serial input 1

Bit No.	Relay
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
(16)	

serial input 2

Bit No.	Relay
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
(16)	

Relay	normally closed	normally open	First value indicator	New value indicator
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

101zw.doc

Bit no. 16 is not received serially, but added internally with the program, if no data are received at the relevant input. Thus, it is possible to control a supervision of the transmitters, incl. their wiring to the relay station.

5 Installation

5.1 Mounting

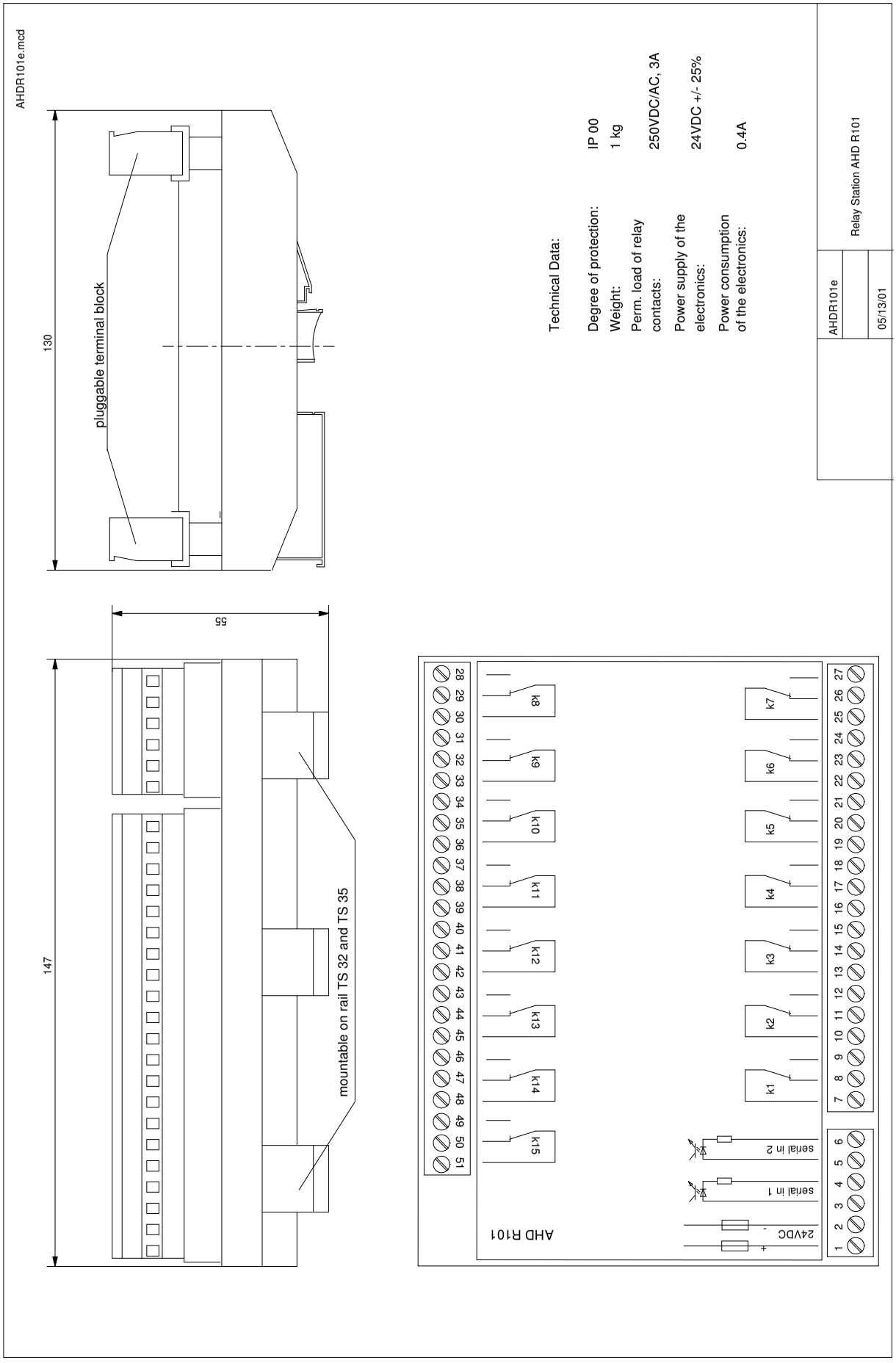
The device is installed in a terminal box, switch panel or any other housing, by mounting it on pre-installed rail TS32 or TS35. In order to avoid movement, e.g. caused by vibrations, standard stoppers can be used.

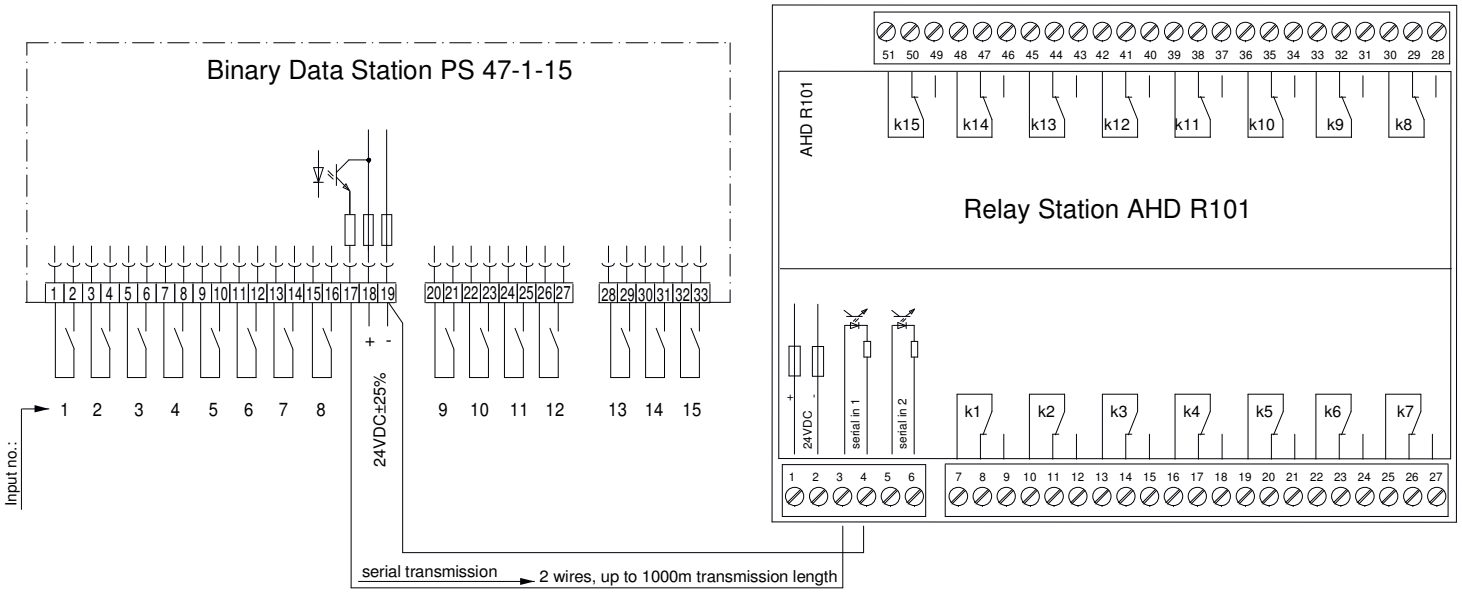
5.2 Wiring of the devices

The serial inputs are separated from each other by optocouplers and galvanically from the power supply. The permitted total impedance of the serial wires is 80 Ohm. This corresponds to a cable diameter (Cu) 0.5 mm² and a cable length of more than 1,000 m. Normally, there are no particular requirements for the cable. Only in case of high EMC stress must a screened cable be used and the screening must be earthed at both ends.

N.B.: In case there are vacant wires within the cable that contains the serial wires, these must be earthed at one end, regardless of EMC stress. Otherwise, they could work as antennas and could overcouple (inductively or capacitively) to the serial wires and thus cause failures.

6. Dimensional Drawing with Terminal Diagram and technical Data



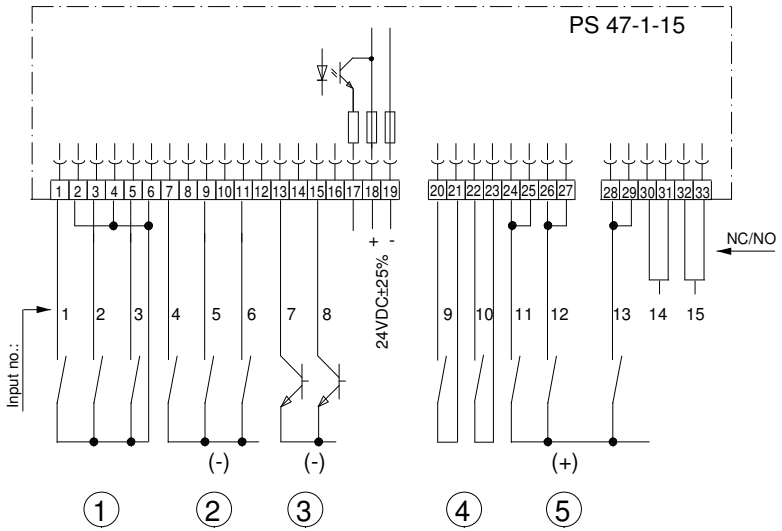


In this example, the inputs are transformed into a serial signal by the binary data station and received by the relay station. Here, relays k1 to k5 are assigned to inputs 1 to 15. This means that if, e.g., input 7 closes, relay k7 switches, too.

Below, possibilities are shown which signals can be registered by the data station. They can be transmitted up to 1000m. Thus, it is possible to reduce the required wiring from 30 to 2 wires. On the receiver side, a floating transfer contact with a permitted load of 250VAC/DC and 3A is available.

Since the relay station contains a microprocessor-system, almost any connections can be realized here. On request, we are ready to offer suitable software adaptions.

Connection possibilities for input of binary signals



Example 1
Registration of 3 binary contacts with mutual feedback.

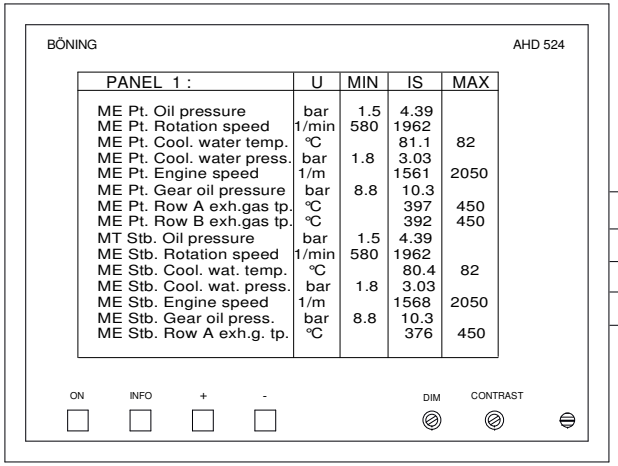
Example 2
Registration of 3 binary contacts with mutual minus-connection. Every second terminal of one input remains unused.

Example 3
Registration of 2 transistors with mutual minus-connection (such sensors are connected like contacts). Every second terminal of one input remains unused.

Example 4
Registration of 2 contacts with 2-pole connection.

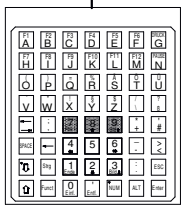
Example 5
Registration of 3 contacts that switch plus-potential. Here, the inputs are shortened in order to cause a potential alternation in the binary data station at switching of the contacts.

parallel-serial transformation of binary signals witht parallel output



PANEL 1 :	U	MIN	IS	MAX
ME Pt. Oil pressure	bar	1.5	4.39	
ME Pt. Rotation speed	1/min	580	1962	
ME Pt. Cool. water temp.	℃		81.1	82
ME Pt. Cool. water press.	bar	1.8	3.03	
ME Pt. Engine speed	1/m		1561	2050
ME Pt. Gear oil pressure	bar	8.8	10.3	
ME Pt. Row A exh.gas tp.	℃		397	450
ME Pt. Row B exh.gas tp.	℃		392	450
MT Stb. Oil pressure	bar	1.5	4.39	
ME Stb. Rotation speed	1/min	580	1962	
ME Stb. Cool. wat. temp.	℃		80.4	82
ME Stb. Cool. wat. press.	bar	1.8	3.03	
ME Stb. Engine speed	1/m		1568	2050
ME Stb. Gear oil press.	bar	8.8	10.3	
ME Stb. Row A exh.g. tp.	℃		376	450

5-pole DIN plug-in connection



The analog data station has 15 inputs and can register and evaluate the following sensors and/or signals:

Pt100, Pt1000, 0(4)-20mA, 0(2)-10V, binary signals (customer-specific ones upon request).

For configuration of the data station, the LCD-display AHD 524 with external keyboard is used. There is the possibility, to e.g. assign up to two limiting values to each input. Over a serial output, the information, if and which inputs reached limiting values, are transmitted to the relay station. Here, the inputs 1 to 15 of the data station are assigned to the relays 1 to 15. This means that if, e.g., input 12 reaches a limiting value, relay k12 switches. Thus, 15 measuring transformers that are independendt of eachother can be realized. Switch-on and switch-off delays from 1 to 999s can be configured. Also, each input can be blocked by another input.

Example:
Input 1 is for registration of the lub. oil pressure of a Diesel-engine. 4-20mA input current correspond to 0 to 10 bar. At 1.5 bar pressure, an alarm shall be released by the relay station. Over input 2, the engine speed is entered over a 4-20mA-signal (4-20mA correspond to 0-3000 1/min). Oil pressure monitoring shall only be done once the engine speed is 8s higher or the same as idle run speed.

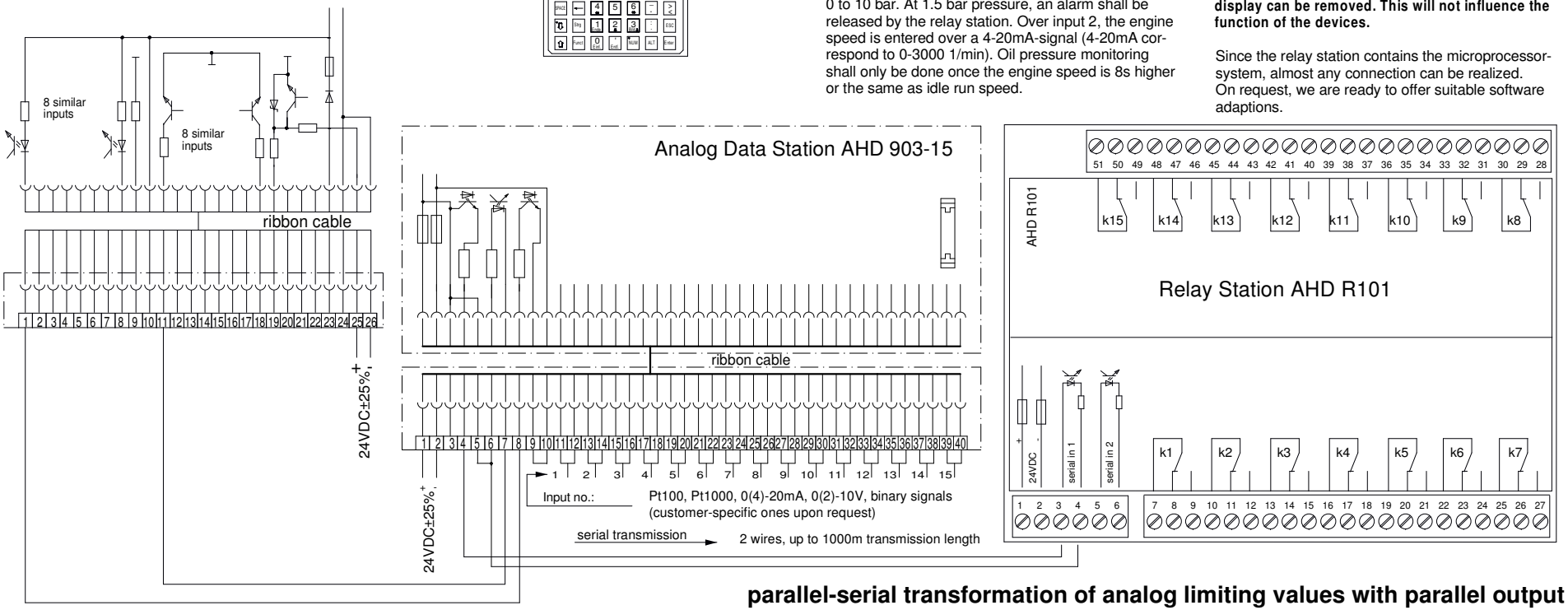
Solution:
With a suitable input-menu, inputs 1 and 2 are configured by the display. A min.-limiting value is assigned to input 1 (1,5bar). A max.-limiting value, that is the same as the idle run speed, is assigned to input 2. Input 1 is blocked by input 2. So as long as the speed limiting value is not reached, the oil pressure will not be monitored. Relay k1 remains dropped. Only 8s after reaching of the idle run speed, relay k2 is activated. In case the oil pressure goes down to 1.5 bar, relay k1 is activated after elapsing of the configured delay time.

Especially for the above mentioned application, there is a software with which the oil pressure can be monitored depending on the rotation speed (please enquire).

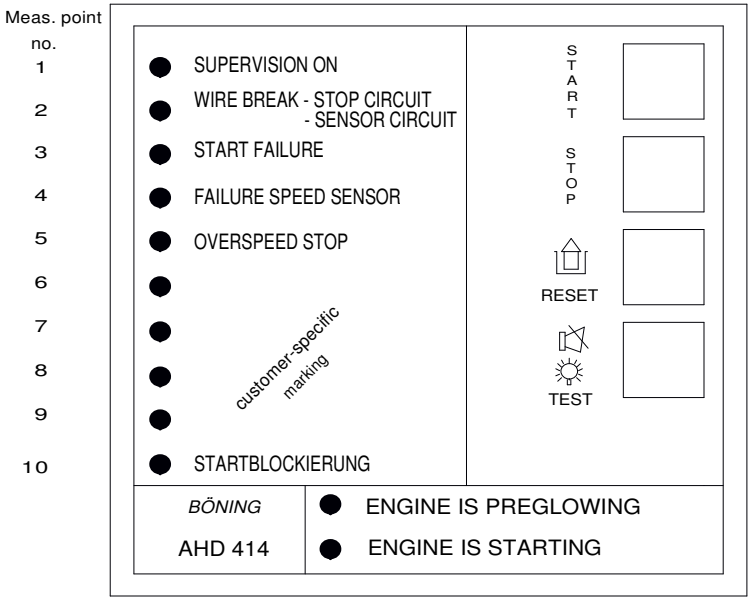
The permitted distance between the devices is 1000m. In case of decentralized placing, wiring is reduced from 30 to 2 wires. A floating transfer contact with a permitted load of 250VAC/DC and 3A is available on the side of the receiver.

After configuration of the data station, the LCD-display can be removed. This will not influence the function of the devices.

Since the relay station contains the microprocessor-system, almost any connection can be realized. On request, we are ready to offer suitable software adaptions.



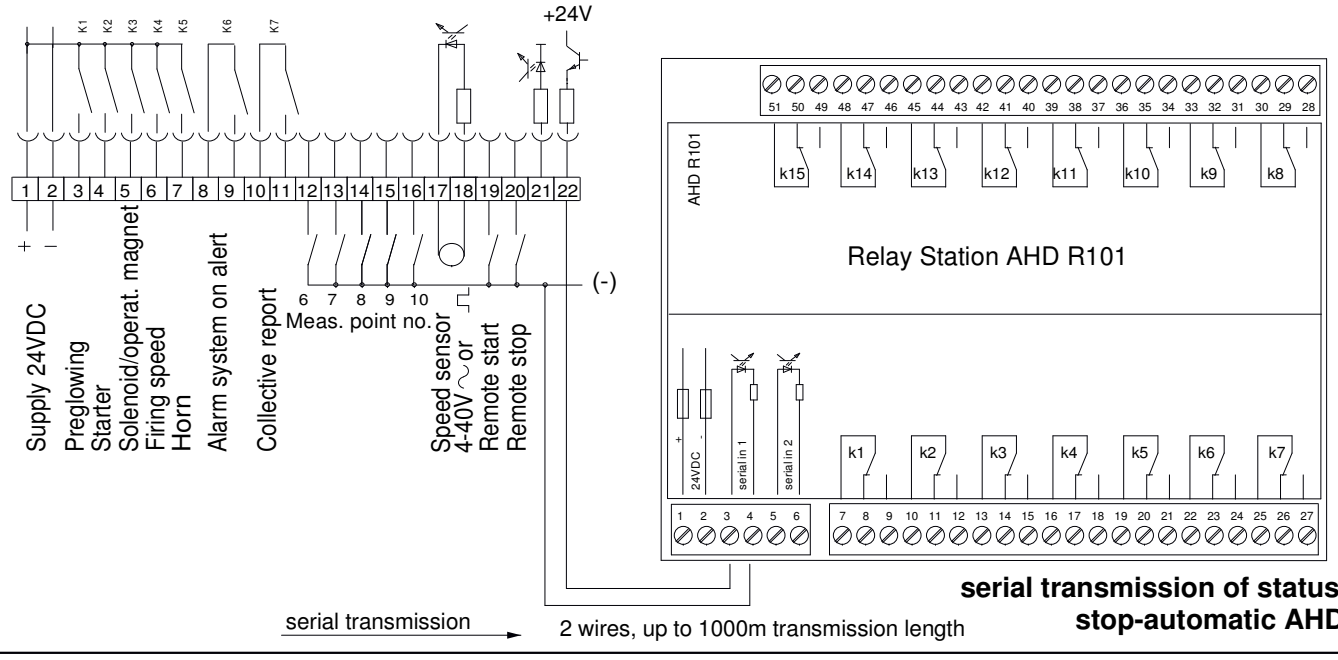
parallel-serial transformation of analog limiting values with parallel output



dd4.doc

The example shows the Diesel-Start-Stop-Automatic AHD 414. It has a serial output that cyclically emits the 15 status signals listed below in intervals of less than 0.5s. By means of the relay station, they can be assigned to the relays 1 to 15. Therefore, if, e.g., the engine is ready for operation, relay k8 switches, and so on.

Since the relay station contains a microprocessor-system, almost any connections can be realized here. On request, we are ready to offer suitable software adaptions.



Serial protocol from the diesel-start-automatic to the relay stations.

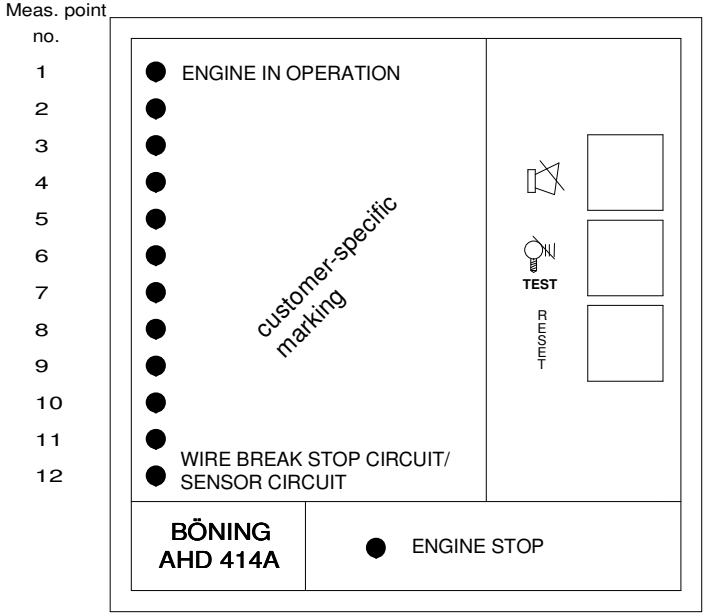
1. Wire break
2. Firing speed
3. Alarm blocking cancelled (MONITORING ON = meas. point 1)
4. Collective alarm
5. Manual stop
6. Engine ready for start
7. Automatic stop
8. Start program is running
9. Measuring point 9
10. Measuring point 8
11. Measuring point 7
12. Measuring point 6
13. Start failure
14. Failure speed sensor
15. Overspeed

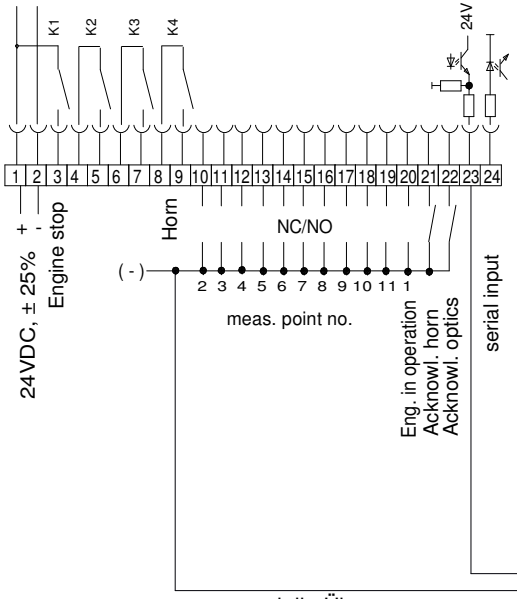
serial transmission of status reports from the diesel-start-stop-automatic AHD 414 with parallel output

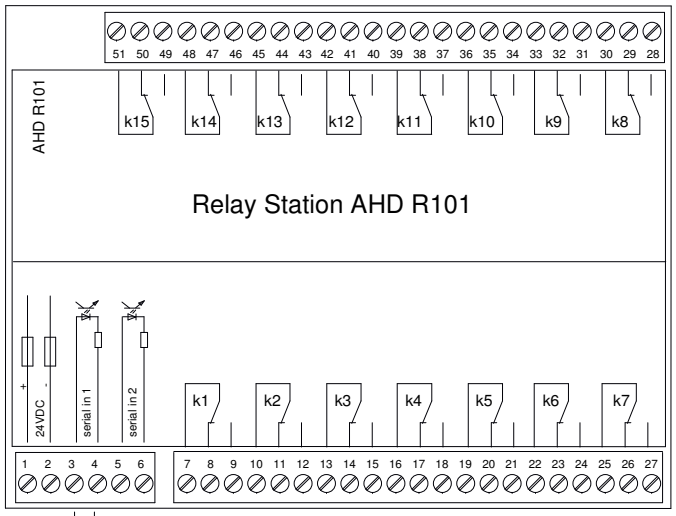
dd5.doc

The example shows the alarm and safety system AHD 414A. It has a serial output that cyclically emits the below listed 15 status signals in intervals of less than 0.5s. By means of the relay station, they can be assigned to the relays 1 to 15.

Since the relay station contains a microprocessor-system, almost any connection can be realized. Upon request, we are ready to offer suitable software adaptions.







Serial protocol from alarm and safety system AHD 414A

Bit-no.

1 to 12 corr. to meas. point 1 to 12

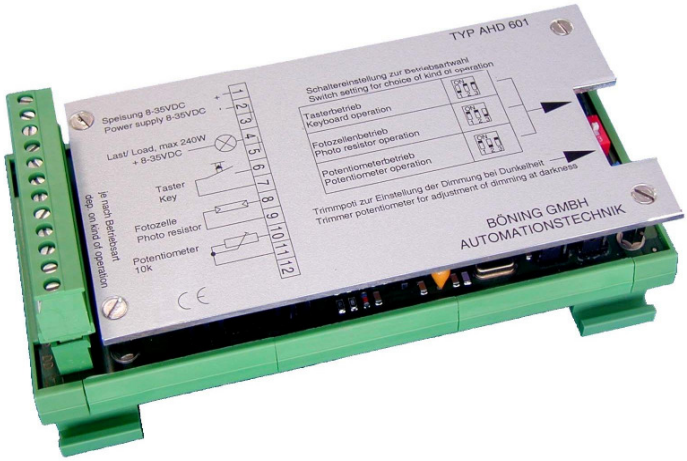
13. group relay k1
14. group relay k2
15. group relay k3

serielle Übertragung → 2 wires, up to 1000m transmission length

serial transmission of status reports from the alarm and system AHD 414A with parallel output

Pulse length dimmer AHD 601 for DC current applications

- **240W (10A at 24V, 20A at 12V)**
- **8 to 35VDC power supply**
- **short-circuit proof**
- 3 adjustable modes of operation possible
  - pushbutton operation
  - photo-resistor operation for automatic, ambient brightness adjustment
  - potentiometer operation
- mountable on rail TS 32 or 35
- plug-in terminal block



Introduction

The pulse length dimmer AHD 601 is used for dimming of lamps and LEDs that are operated with a DC current of 8 to 35V with 240W. The permissible permanent current at 24V power supply is therefore 10A. A load of 18A is permissible for a short time. The device is also appropriate for interior lights, e.g. on yachts.

Design/Function

AHD 601 consists of an electronic unit with a processor system in a housing for rail mounting (TS 32 or TS 35). A 12-pole plug-in terminal block is provided for the external electrical connections.

Dimming is carried out by emitting pulse lengths that depend on the adjustment, or on the ambient brightness when photo resistor operation is selected. The frequency, which is independent of the relevant dimming, is approximately 85Hz. This is invisible to the human eye and therefore flicker-free.

The device is protected against overheating, as well as against short-circuiting. In both cases, the integrated power switch shuts off electronically. After the short or the overtemperature has been remedied, the device becomes operational again and automatically restarts. AHD 601 has an integrated protection against incorrect polarity.

A trimming potentiometer is provided on the printed circuit board for limitation of dimming.

Without this limitation, the pulse-length pause ratio in darkness is approximately 1:200, i.e. the dimmer is only turned on for about 0.5% of the whole time (max. dimming).

Mode of operation

The dimmer has the following three modes of operation which can be selected with a DIP switch:

Pushbutton operation:

Pressing on this key alternates between the status on (100%) and off (0%). Permanent pushing of the key causes a ramp-shaped dimming process (0-100%). The dimmer is continuously activated until maximal brightness is reached and then shuts down again in a reverse course. If the lamp (or any other consumer) is already dimmed, the dimmer switches off every time it is briefly activated.

Operation with a photo resistor:

In this operating mode, dimming is carried out automatically, in dependence on ambient brightness. If the photo resistor is activated sufficiently by the ambient light, the dimmer responses with maximum brightness. At dusk, it will reduce its brightness. In complete darkness, it is dimmed to the maximum.

Operation with a potentiometer:

A 10kOhm potentiometer is connected at terminals 10 and 11. The brightness of the dimmed consumers depends on its adjustment.

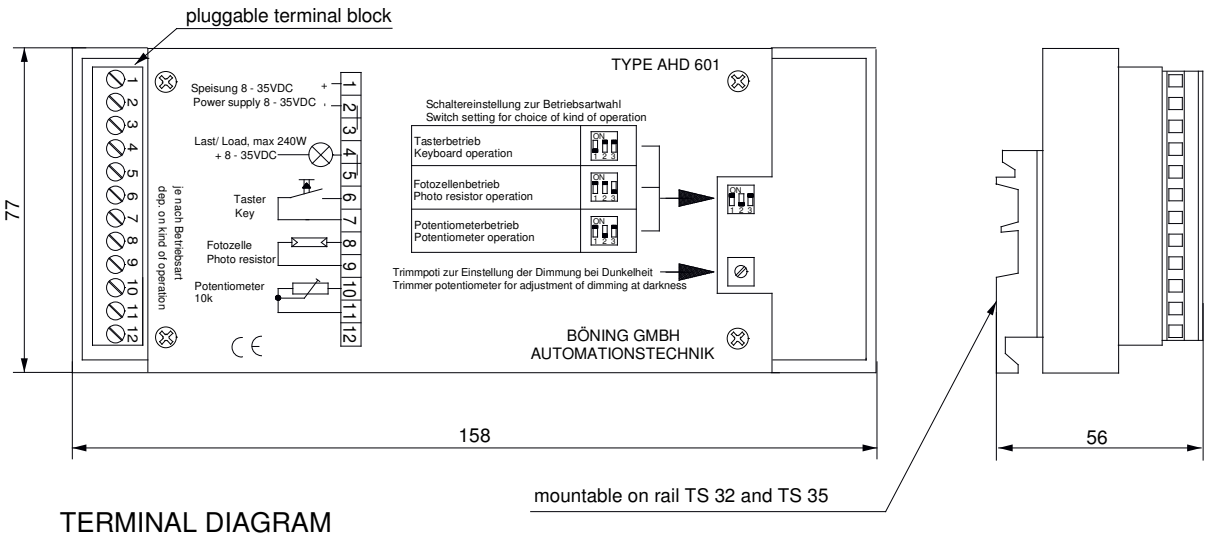
The devices are delivered preset on potentiometer operation.

BÖNING Automationstechnologie

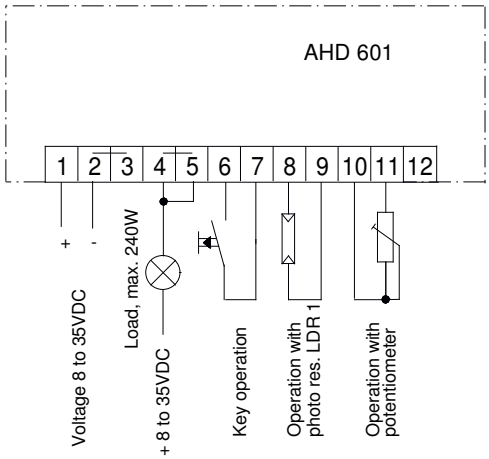
Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

DIMENSIONAL DRAWING

AHD601Ce.MCD



TERMINAL DIAGRAM



Switch positions for choice of kind of operation

Key operation	
Photo resistor operation	
Potentiometer operation	

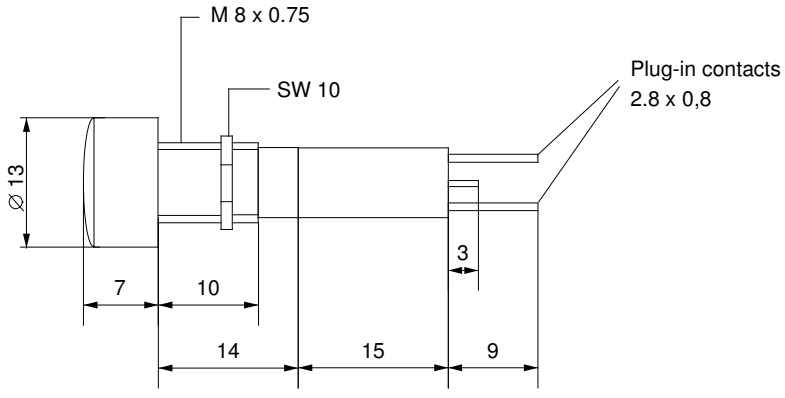
Connection depending on kind of operation

TECHNICAL DATA

Power supply	: 8 to 35VDC
Perm. load	: 240W (10A at 24V, 20A at 12V)
Weight	: 0.3 kg
Potentiometer	: 10k (larger or same as 0.2W)
Perm. ambient temperature	: 0 to 70°C

Attention: If device and load are powered by different sources, both sources must be connected minus-sided with each other.

PHOTO RESISTOR FOR DESK INSTALLATION TYPE LDR 1



INSULATION MONITORING DEVICE
AHD 519

519-kate.mcd

GENERAL DESCRIPTION

AHD 519 is an electronic device for the continuous monitoring of electrical insulation resistances and is mainly used for electric engines. Measurement is done at resting engine.
The device is mounted in a case for rail mounting (TS32/TS35). All connections are done over a 12-pole terminal block.

FUNCTIONAL DESCRIPTION

On the circuit, there are 3 DIP-switches which enable setting of 1 out of 7 reference resistance values according to chart 1. If the insulation resistance falls below the preset value, a relay switches that can be used either for alarming or to block switching on of the consumer.

Chart 1 (stop-alarm)

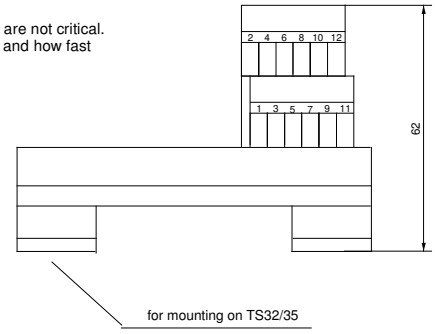
Limit. value (Ohm)	Switch on 1	2	3
1.16M	-	-	-
1.0M	x	-	-
0.92M	-	x	-
0.89M	-	-	x
0.75M	x	x	-
0.74M	x	-	x
0.70M	-	x	x
0.52M	x	x	x

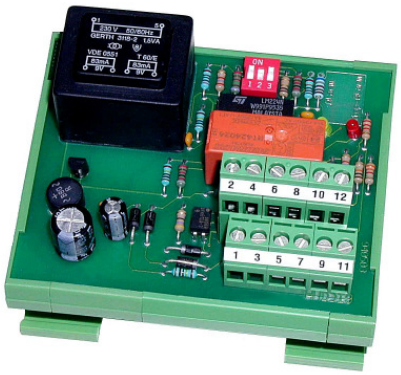
In case the insulation resistance drops to about 20% over the preset value, this will cause a pre-alarm. This pre-alarm is transmitted to the terminal block via an optocoupler. It is normally closed and is blocked in the event of an alarm. In the event of a power failure, the optocoupler will also be blocked.

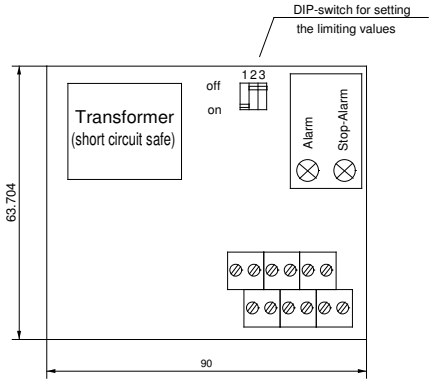
The first alarm levels are aproximately 0.3MOhm over the Stop alarm level.

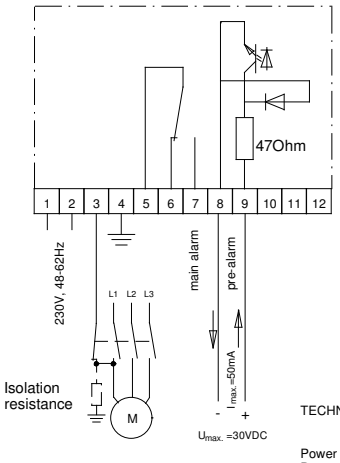
Dropping of the insulation resistance is usually a slow process and measuring and alarming time are not critical. In order to avoid false alarms, the electronics operates with a time delay that depends on how far and how fast the value falls below the pre-set insulation resistance. It can take up to a couple of minutes.

Pre- and main-alarm will be indicated additionally on the circuit board by a yellow and a red LED.









Attention: The optocoupler is switched through as usual (no pre-alarm, which means the route from terminal 9 to 10 only has a low ohm resistance. In the event of a pre-alarm, it becomes a high ohm resistance. The voltage direction is from term. 9 to 8. If an external device, e.g. SPS is connected wrongly, the voltage will flow over the protection diode, which means the route from term. 8 to 9 can always pass through, independent of the status of the optocoupler.

TECHNICAL FEATURES

Power supply	: 220V, 48 - 62Hz, +- 25%
Power consumption	: 0.04A aprox.
Perm. load of relay contacts	: 250 VAC/5A or 50 VDC/2A
Perm. load at optocoup. output	: 30 VDC
Degree of protection	: IP 00
Weight	: 0.2 kg aprox.
Permissible amb. temperature	: 0 - 65 °C

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

MODULAR NAVIGATION LIGHTS CONTROL AND MONITORING SYSTEM
DPS 01

- System consists of:
  - base module AHD 901 G
  - 1 - 4 substations AHD 910 A (8 - 32 light circuits)
  - one or more control and display units AHD 406-2D (individual design according to instructions)
  - parallel display(s), if necessary
- suitable for all common light voltages (24 V DC/AC to 250 VAC)
- lights are connected directly with the substations (no further terminal block required)
- light circuits are protected from two sides
- connection of parallel displays possible
- even in case of electronic fault, operation of the lights is still possible.
- LEDs in the display unit can be freely assigned to the navigation lights
- modules control each other
- dimming of display elements with photo resistor
- display and operating panel AHD 406-2D can be delivered with front-cap (protection IP 54)
- GL certified

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

1. Design

The unit consists of :

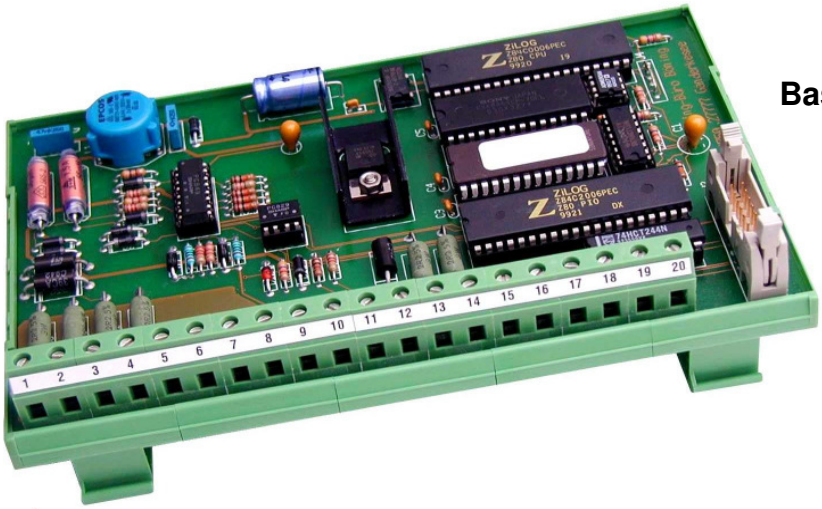
- 1 base module AHD 901 G
- 1 to 4 substation modules AHD 910 A with 8 light circuits each
- 1 display and control unit AHD 406-2D
- 1 selector switch
- parallel displays AHD 406-2D and/or further switches, if necessary

The devices are connected with each other by ribbon cables.

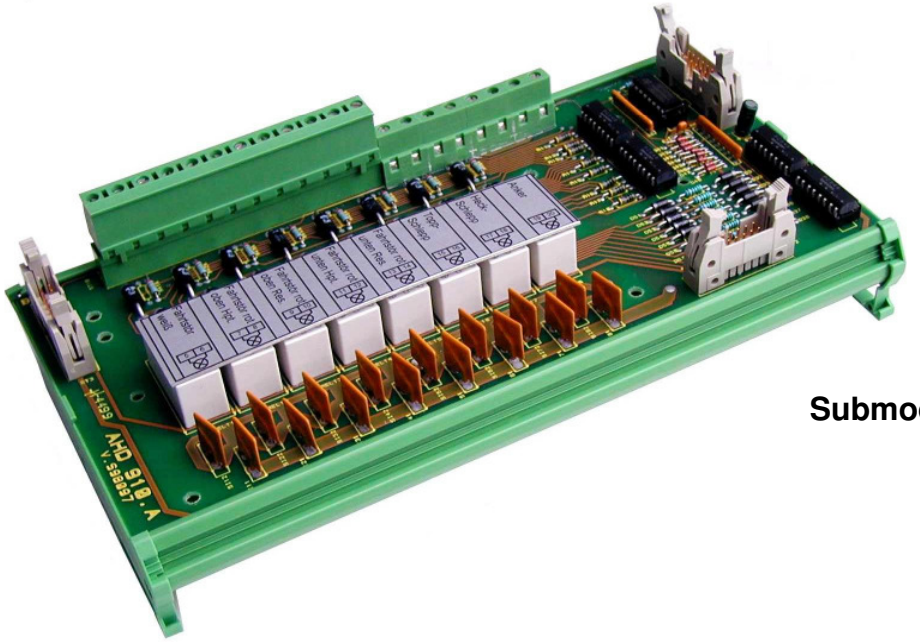
2. Function

Main and emergency power supply, as well as the selector switch, are connected to the base module AHD 901 G. The base module monitors the main and emergency supply and communicates via serial bus with the substation modules and the control unit.

The navigation lights are controlled by switches in the control unit and auxiliary relays on the substations. Up to 8 lights can be connected to each of the four possible substation modules AHD 901 A. Thus, 32 light circuits can be controlled and monitored by a single system. There is bipolar protection of the light circuits. The fuses are located directly behind the relays that belong to the light circuit. Safety fuses are used for 230V lights, and automatically resetting semiconductor fuses for 24V lights. The principle design of the system enables installation of several control units with displays, as may be required.



Basic module AHD 901G, 24VDC



Submodule AHD 910A, 24VDC

The electronics distinguish between the following conditions:

- light is switched off
- light is switched on and illuminated
- light is switched on and not illuminated (alarm, if main switch is not in OFF position)

This information is processed in the base module AHD 901 G and transmitted via serial bus to the display and control unit AHD 406 2D. The condition of the lights is displayed here as follows:

- light is switched off: 'Display-LED off'
- light is switched on and illuminated: 'Display-LED on'
- light is switched on, but not illuminated, and main switch is not in OFF position: 'Display-LED flashing'

A buzzer is installed in the display and control unit. It is activated at every alarm and that can be acknowledged by means of the designated push button on the front panel. The flashing LEDs that indicate the faulty state of the navigation lights can not be deactivated, as otherwise there might be confusion between them and the switched-on and illuminated lights. These LEDs are automatically dimmed by a photo cell.

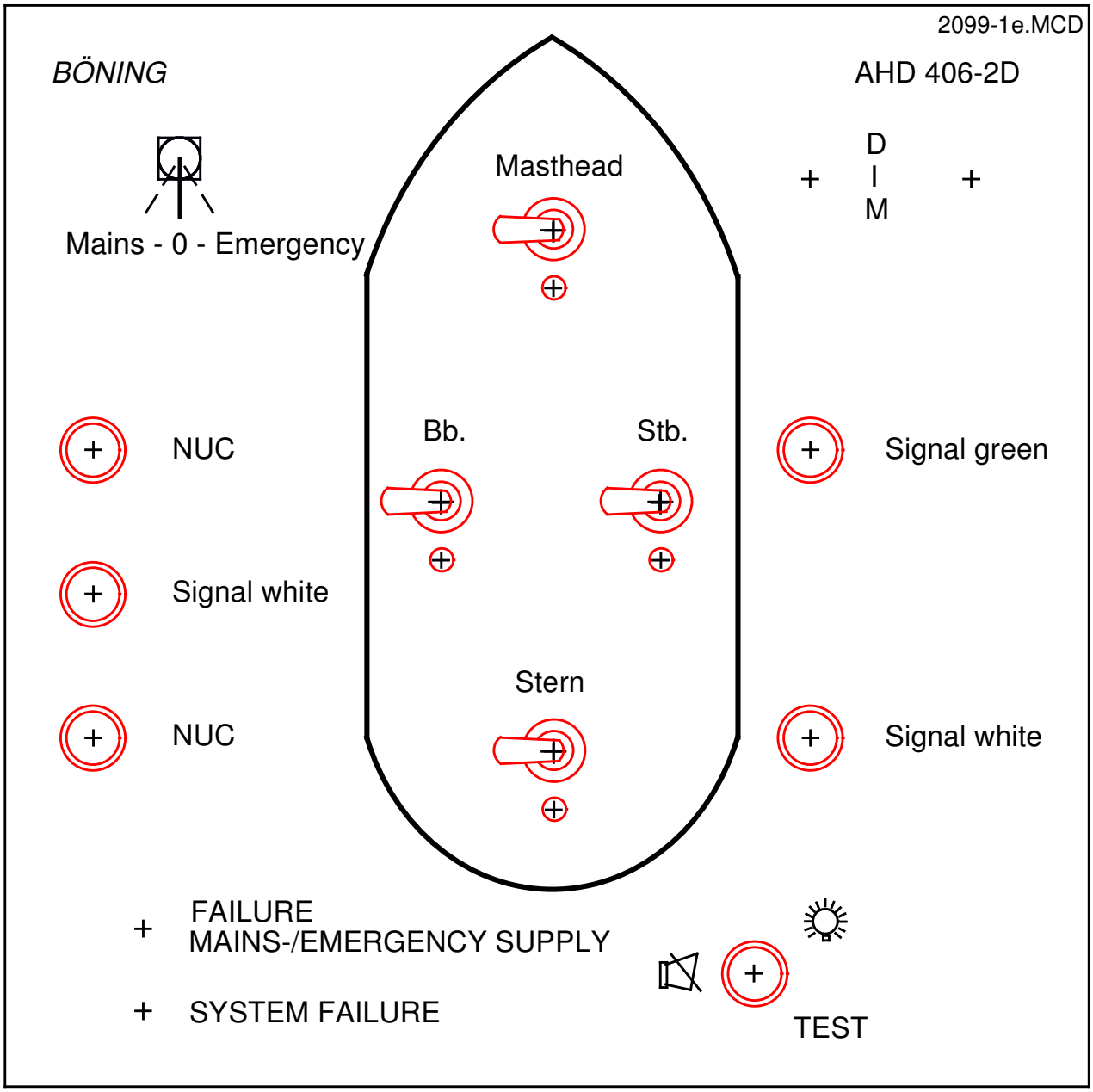
The display and control unit AHD 406-2D is designed according to the customer's instructions and adapted to respective requirements. The standard front dimensions are 144mm X 144mm or 192mm X 144mm. The aluminum front panel is standard black with white print.

EVEN IN THE EVENT OF BREAKDOWN OF THE ELECTRONICS, THE LIGHTS CAN STILL BE CONTROLLED.

3. Commissioning

a) Set selector switch to 'Main Supply'.
b) Switch the lights on separately checking whether the correct lights are on.
c) Switch on all lanterns in sequence, break the relevant circuit to check if the alarm is triggered. Check signal horn reset together with light test.
d) Set selector switch to position 'O' and switch on one of the navigation lights. The light does not glow and no alarm should be activated.
e) Set selector switch to position 'Emergency Supply' and switch on one of the navigation lights. The lantern must glow.
f) Alternately switch off main and emergency supply. In both cases, the alarm 'Main/Emergency Supply' must then be activated.

Example for front panel:



Individual lights are operated by means of an illuminated push button that can be red, yellow or green.

Double lights are controlled by means of a toggle switch with a neutral position. Below the toggle switch there is a red, yellow or green LED.

Marking of lanterns with indication of color.

406d2e.mcd

Customer :	
Order-no. :	Voltage :

Submodule 1			Submodule 2		
No.	Marking of lamps	Color [1]	No.	Marking of lamps	Color [1]
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		

Submodule 3			Submodule 4		
No.	Marking of lamps	Color [1]	No.	Marking of lamps	Color [1]
1			1		
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		

[1] red, yellow or green

Frontlayout for operating units with front dimensions of 144mm x 144mm

406d2e.MCD

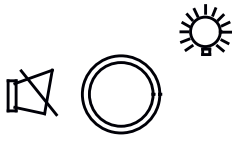
BÖNING

AHD 406-2D

Mains - 0 - Emergency

FAILURE
MAINS-/EMERGENCY SUPPLY

SYSTEM FAILURE



TEST

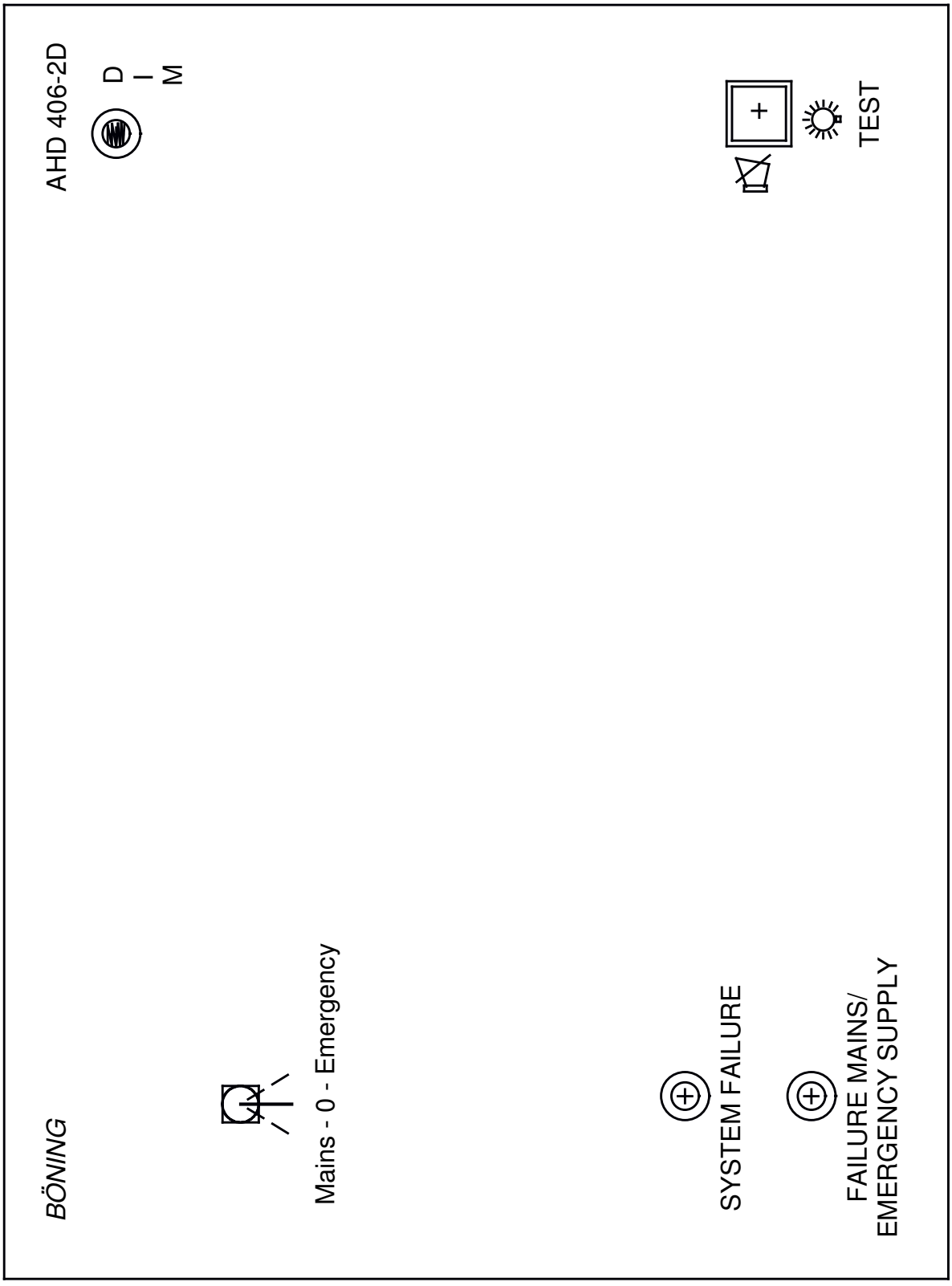
Please enter your draft with arrangements of lanterns.

In case only individual lanterns are used, this symbol is inapplicable

Mains - 0 - Reserve

Frontlayout for operating units with front dimensions of 192mm x 144mm

406d2.MCD

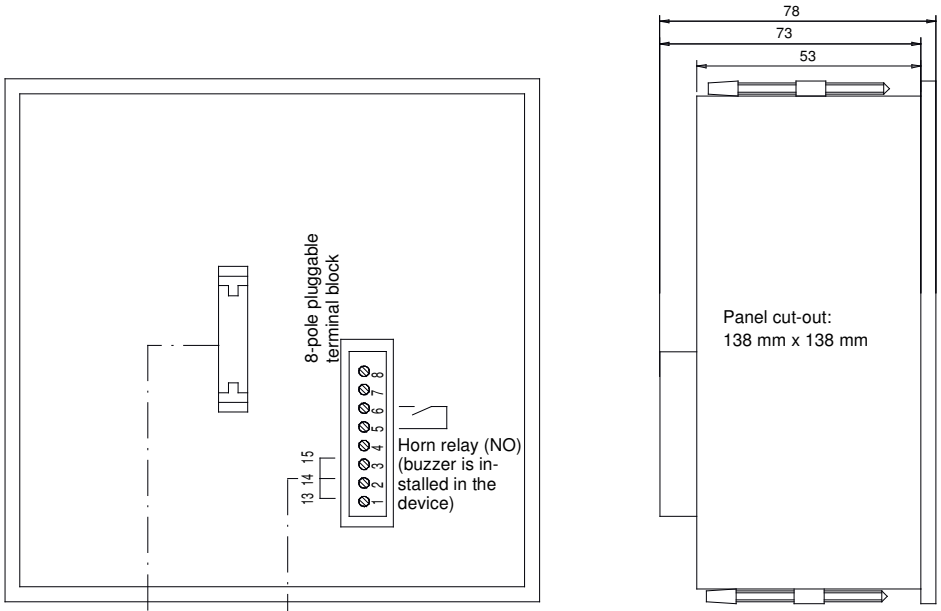


Please enter your draft with arrangements of lanterns.

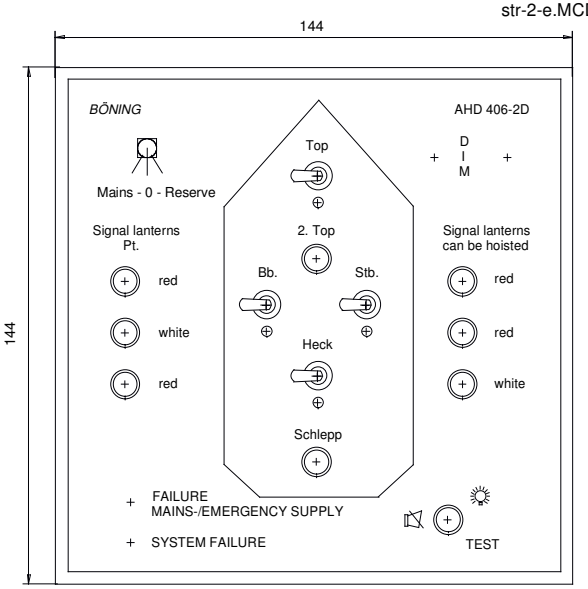
In case only individual lanterns are used, this symbol is inapplicable 

Mains - 0 - Emergency

str-2-e.MCD



Power cons. of the electronics app. 0.25A
(1 x AHD 901G, 2 x AHD 910A, 1 x 406-2D)



Front panel design and amount of switches is subject to agreement.

20-pole ribbon cable

10-pole ribbon cable

10-pole ribbon cable

14-pole ribbon cable

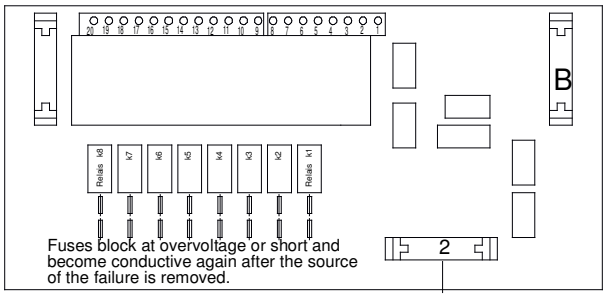
14-pole ribbon cable

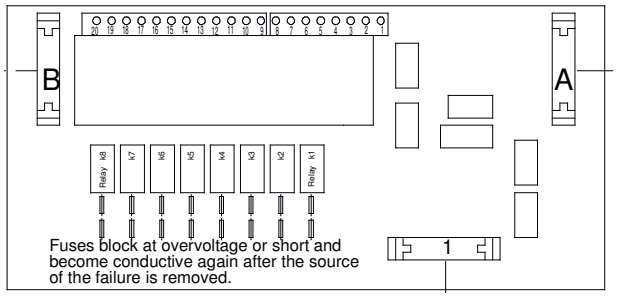
Tow 16
2nd Top 15
Signal white (hoistable) 14
Signal red (hoistable, from below) 13
Signal red (hoistable, from top) 12
Drive failure red (below) 11
Drive failure white 10
Drive failure red (on top) 9

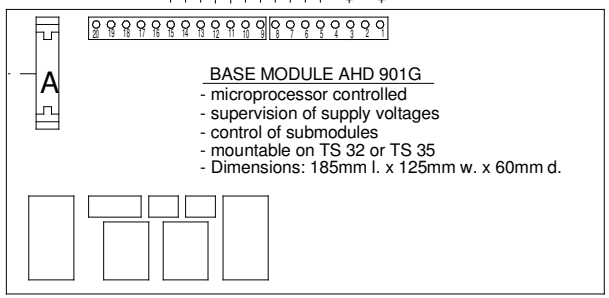
Stern, Res 8
Stern, Main 7
Stb, Res 6
Stb, Main 5
Pt, Res 4
Pt., Main 3
Res. Top 2
Top 1

SELECTOR SWITCH
Klöckner Moeller
Type TO 3-8212
Mains supply
Off
Emergency supply

24VDC±25% Emergency supply
24VDC±25% Mains supply







BASE MODULE AHD 901G
- microprocessor controlled
- supervision of supply voltages
- control of submodules
- mountable on TS 32 or TS 35
- Dimensions: 185mm l. x 125mm w. x 60mm d.

SUBMODULE AHD 910A

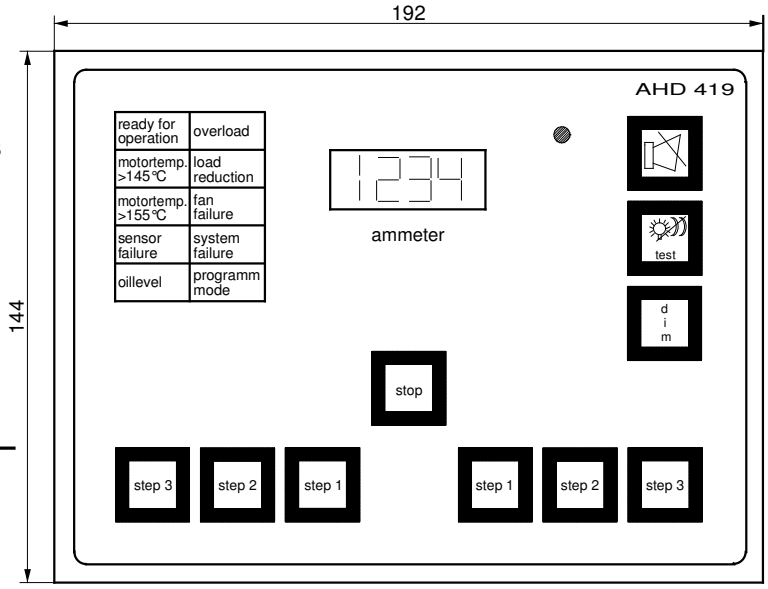
- for addressing of 8 monitored lamps
- mountable on TS 32 or TS 35
- dimensions: 235mm long x 125mm wide x 45mm deep

Function of the position lanterns is guaranteed even at failure of the electronic.

bugbw-e.mcd

DECENTRALIZED BOW THRUSTER CONTROL

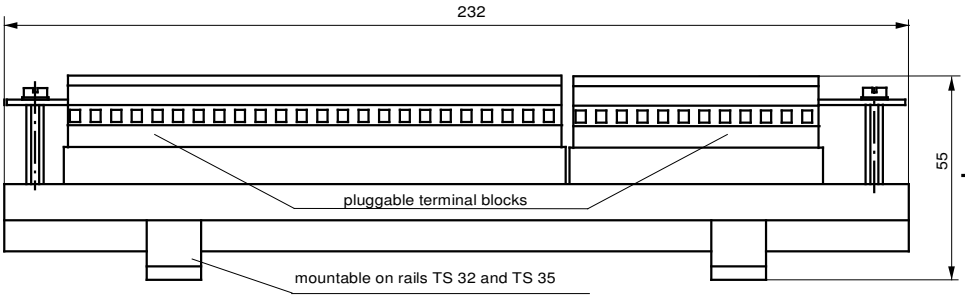
Operating Unit AHD 419
on bridge and wing panels

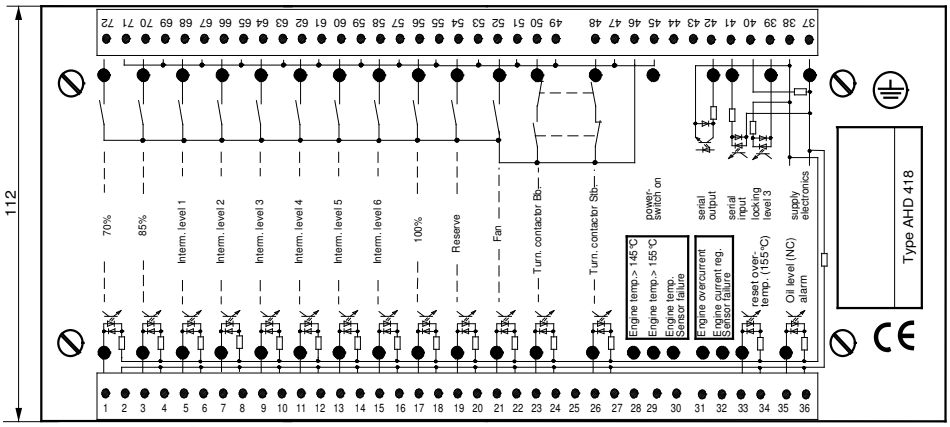


4 wires incl. power supply

to next operating unit

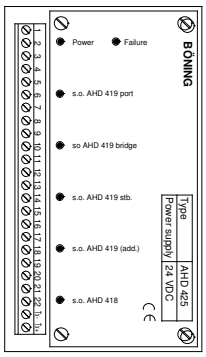
- optimized system for electronic control of bow thrusters driven by slip-ring rotor engines
- small, powerful and robust devices
- serial communication reduces required wiring to only 4 wires
- analog entry of engine current and coiling temperature; therefore no additional signal processor required
- current limiting values depend on the level and are programmable via the operating unit
- status of all in- and outputs of the central unit are visualized by LEDs: clearly and directly at the terminal blocks.
- integrated digital ammeter in the operating units
- up to four operating units connectable
- can be connected to voyage recorder with interface module AHD 425
- type-approved by: ABS, BV, DNV, GL, LRS





4 wires incl. power supply

Interface Module AHD 425 (optional)



Voyage-Recorder

Central Unit AHD 418
at power element

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

Contents Page

1.0	Introduction	3
1.1	Design and performance features	3
1.2	Description of functions	3
2.0	Central Unit AHD 418	4
2.1	Inputs	5
2.2	Outputs	6
2.3	DIP switch settings	6
2.4	Technical data	7
2.5	Relay life	8
2.5	AHD 418 Dimensions	9
3.0	Control Unit AHD 419	10
3.1	Master control console and the ON/OFF function	10
3.2	Alarms and indicators	10
3.3	Operating controls	12
3.4	Programming the current limit values	13
3.5	Dimensions and panel cut-out for AHD 419	14
3.6	Technical data	15
4.0	Connecting the bow thruster control to a data log	16
4.1	General	16
4.2	Design	17
4.3	Function	17
4.4	Installation	17
4.4.1	Fitting	17
4.4.2	Equipment wiring	17
4.4.3	DIP switch settings	18
4.5	Technical data	19
4.6	Dimensions	19
4.7	Serial output protocol	20
5.0	Connection diagram for installations with no data log	21
5.1	Connection diagram for installations with data log	22

1.0 Introduction

The following description refers to the electronic components of the bow thruster control. The drive unit consists of a 3-phase asynchronous motor (slip-ring rotor) and variable pitch propeller. The rotation speed, and thus motor power, is varied by switching resistances in and out of the rotor circuit. Changing the direction of rotation, and consequently the ship's direction of movement (port/starboard), is achieved by switching over two of the phases.

1.1 Design and performance features

The bow thruster control consists of a central unit AHD 418, which is installed either next to the power unit or in the bow thruster control cabinet, and a number of control units AHD 419. In addition there is an optional interface module AHD 425 for connecting a data log. Up to 4 control units can be connected. Normally there will be one control unit on the bridge and one at each bridge wing control position.

The equipment is interconnected by means of a 4-core parallel bus cable, which also carries the power supply. Serial communication results in minimum wiring.

1.2 Description of functions

The system is connected up in accordance with the wiring diagrams at the end of this document. The system is set in operation by means of the 'ON' switch on the bridge console, and the power switch on the main switch panel. All the alarms are then simultaneously armed and the fan activated. Operational readiness is indicated by a green lamp.

On the AHD 419 control panel (see page 11) there are three step-buttons for port and starboard respectively, by means of which the bow thruster can be driven in the desired direction and at the desired power level. For example, if 'Step 3, Port' is selected when in the idle state, the relevant changeover contactor operates first, followed at programmable time intervals by the contactors for 70%, 85%, maximum of 6 intermediate steps, and finally the 100% step. Three switching sequences can be set. Other switching sequences, as well as the number of intermediate steps between 85% and 100%, are factory programmable.

During ramping-up, the actuated contactors are checked to confirm that they have actually switched over, each having a potential-free contact which is led back to the central unit for monitoring. If this confirmation is unsuccessful, the equipment automatically switches back one step, and the 'Load Reduction' and 'System Failure' alarms are activated. However, if the feedback from a contact yields a positive result even though the relevant contactor was not activated, the bow thruster stops, and the 'System Failure' alarm is activated.

The motor current is read by the central unit in analogue form via a 1000:1 current transformer, converted to serial format and then displayed on the control units as a 4-digit number. (The equipment can also be factory modified to use current transformers with other division ratios). At the same time the magnitude of the current is constantly being compared with the limit set for that particular step. If the current is exceeded, the 'Overload' and 'Load Reduced' alarms are triggered after 10 seconds (other intervals on request), and the system switches simultaneously to the next lower step. If the current measured at this step is still too high, the system switches back a further step within the same clock interval, repeating until it finally stops.

As well as the current, the temperature is also monitored. For this purpose the AHD 418 central unit has an input 'Temp > 145°C' which triggers an alarm. A further input 'Temp > 155°C' results in the bow thruster switching off. The temperatures are read in analogue form,

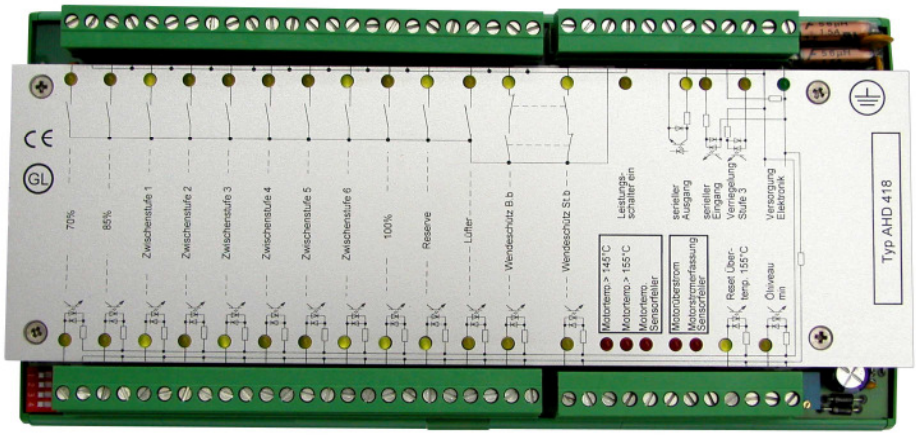
so there is no need for additional processing hardware. The sensors are assembled into the windings by the motor manufacturer and are PTC thermistors conforming to DIN 44081 – triplet sensors (others on request).

The AHD 418 is programmed in such a way that, following a 155°C alarm and subsequent shut down, it cannot simply be restarted after the system has cooled down. This alarm can only be cleared 'in situ'. The AHD 418 has a further dedicated input 'Reset overtemperature' which in this instance must be activated first. It will therefore be necessary to enter the bow thruster area and investigate the cause of the problem. If this function is unwanted, the 'Reset' input must be bridged.

A dedicated input is available for connecting an engine-mounted oil level monitor. If the level falls below the minimum permissible, an alarm is flagged on the control panel. In addition, the module has an input for limiting the maximum power to 85%. If this is activated, the 'Load Reduction' indicators on the control units light up, but there is no sound warning. By means of this function, power supply overloads can be avoided if, e.g., not all the auxiliary generators are in operation.

2.0 Central Unit AHD 418

AHD 418 is a module intended for installation in a switch cabinet and is mounted on TS32 or TS35 bus rails. The central unit is a microcontroller-based electronic module with the following features:



- serial communication with up to four AHD 419 control units
- direct access to the changeover, step, and intermediate contactors, including monitoring of their feedback signals
- control of the three main steps (70%, 85%, 100%) and up to 6 intermediate steps
- fan control and monitoring
- monitoring of the motor current and winding temperatures
- monitoring of the motor oil level
- monitoring of the contactor actuating voltage (power switch)
- controllable blocking of the 100% step
- high capacity relays for contactor control; the use of auxiliary contactors is only necessary in exceptional cases
- integrated LED status indicators for all inputs and outputs, as well as the most important alarms (over-current and over-temperature) in the AHD 418 control unit

2.1 Inputs

All the available inputs, together with their applicable parameters, are described below:

Input	Sensor	Delay (Sec.)	Alarm/Display AHD 418	AHD 419	Response
Motor temp. 145°C Analogue I/P with sensor failure monitoring	PTC-Thermistor DIN44081– Triplet sensor	7	LED (red)	motortemp. >145°C	Early warning
Motor temp. 155°C Analogue I/P with sensor failure monitoring	PTC-Thermistor DIN44081– Triplet sensor	7	LED (red)	motortemp. >155°C	System shuts down.
Current 0-1500mA AC Analogue I/P with sensor failure monitoring	Current txfmr 1000:1 (250:1), others on request	10	LED (red)	Overload	Reduce by one step.
Reset overtemp alarm	Contact	1	LED		Stop - Cancel 155°C overtemp. alarm.
Step 3 blocking	Contact	1	LED	Load reduction	Power limited to 85% max.
Oil level	Contact	10	LED		Alarm triggered.
11 x contactor acknowledgement: step contactors 70%; 85%, Z1-Z6, 100%. changeover contactors: pt; stbd	Contact	0.7	LED	System failure, load reduction	Alarm triggered if acknowledgement contact has not closed within the delay time following contactor actuation.
		1		System failure (without further message)	Alarm triggered if acknowledgement contact has closed without a contactor being actuated.
Fan contactor acknowledgement	Contact	3	LED	Fan failure	Alarm triggered if acknowledgement contact has not closed within the delay time following contactor actuation.
Power switch (230V AC)	Optocoupler	1	LED	Power switch failure	Alarm triggered if power switch fails.
Serial input	Optocoupler	5	LED extinguishes	System failure. Display shows "E-SE"	System shuts down if no data can be received from AHD 418

N.B.:

The times given in the delay column refer to the internal status of the AHD 418 central unit. As a result of the serial communication, including data checking, a further 1 to 2 seconds, depending on the signal, can elapse before the result is displayed on the AHD 419 control panel.

The analogue motor temperature inputs have a hysteresis characteristic. The alarm ON resistance is approx. 3 kOhm, and the OFF resistance approx. 1.5 kOhm. A sensor error is generated if the resistance value is greater than approx. 25 kOhm.

During current measurement, a sensor error will be generated if any power step is activated and the current is at the same time less than 50 A. The time delay for a sensor error signal is the same as that of the corresponding alarm and is thus 7 or 10 seconds.

2.2 Outputs

All the available outputs, together with their applicable parameters, are described below:

Output	Contact	Display/Response
11 x step contactor 70%; 85%, Z1-Z6, 100%	Normally open : 250VAC, 6 Amp. resistive load. With inductive loads the contact life is reduced dependent on power factor (see page 8)	Status indication LED
2 x changeover contactor: port, starboard	Normally open: 250VAC, 16 Amp. resistive load. With inductive loads the contact life is reduced dependent on power factor (see page 8)	Status indication LED
Serial output line break	Optocoupler	LED extinguishes if line breaks. AHD 419 stops sending Data. This leads to the AHD 418 system shutting down.

2.3 DIP Switch Setting

The switching logic and switching times can be set by means of a 4-way DIP switch located beside the terminal strip (1) on the module. A further 2-way DIP switch situated beneath the cover enables the use of a different current transformer. Switch combinations not shown are reserved for internal use and may not be selected.

Factory settings are shown in **bold** print.

a) 4-way DIP switch:

Switch		**Switching logic – Step sequence**									
1	2	WSch	70%	85%	Z1	Z2	Z3	Z4	Z5	Z6	100%
off	**off**	**X**	**-**	**X**	**X**	**X**	**X**	**-**	**-**	**-**	**X**
off	on	X	X	X	X	X	X	X	X	X	X
on	off	X	X	X	X	X	-	-	-	-	X

Switch		**Switching times (sec.)**		
3	4	Step change	Direction change Port ⇔	Starboard
off	**off**	**2**	**4**	
off	on	3	5	
on	off	4	6	

b) 2-way DIP switch:

Switch		**AC current transformer ratio**
1	2	
off	**off**	**1000 : 1**
on	off	250 : 1

2.4 Technical Data

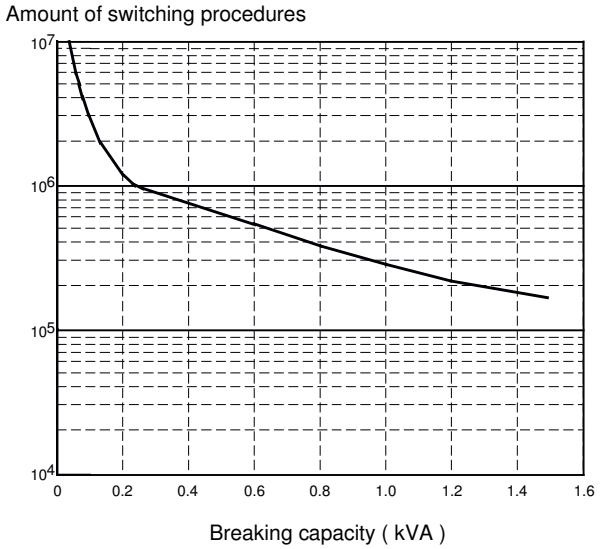
Supply voltage:	24 VDC +/- 25%
Current consumption:	max. 0.3 Amp.
Weight:	700g
Inputs:	2 x analogue for temperature acquisition (PTC-DIN44081-triplet) 1 x analog for current acquisition 16 x optocouplers for control, alarms, acknowledgement and communication
Optical indicators:	38 x LED for alarm or status indication
Outputs:	11 x contact 250VAC/1500VA for step contactors and fan 2 x contact 250VAC/4000VA for changeover contactors, port and starboard 1 x optocoupler for communication

2.5 Relay Life

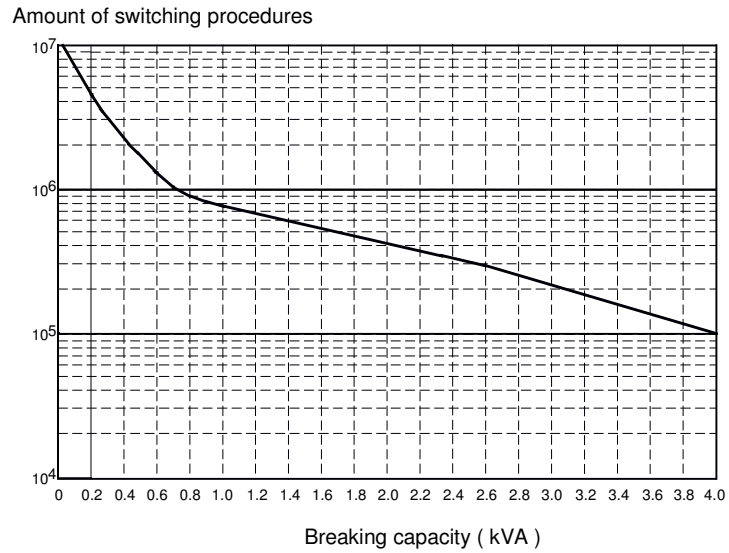
Relays are fitted on the AHD 418 printed circuit board for controlling external contactors. The contactors do not form part of the supplied equipment, but rather are specified and fitted by the main equipment manufacturer. The following diagrams will help with their design.

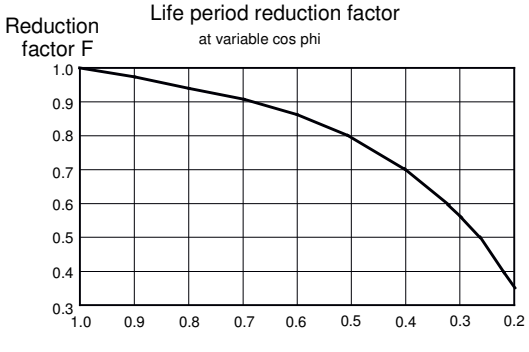
Contact life period for level-, fan- and reserve relays

418r1-e.mcd



Contact life period for turning relays

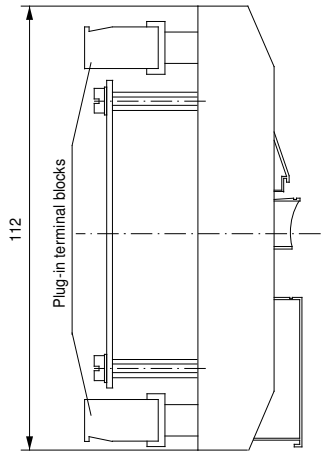




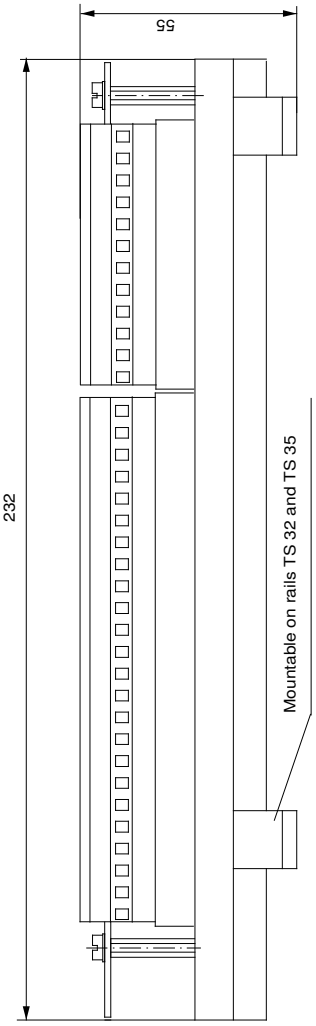
418r.doc

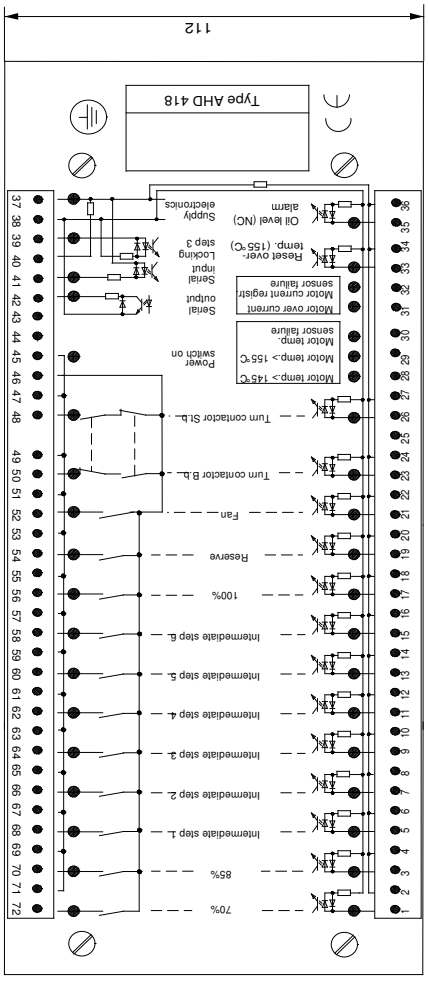
Parallel to the output terminals of the relays and therefore also parallel to the external power contactors, there are condensators and varistors. Both Measures prolong the life span of the relays. The diagrams are taken from the documentation from the relay manufacturer and do not take this into account.

2.6 AHD 418 Dimensions



41893A-e.MCD





3.0 Operator and display unit AHD 419

The AHD 419 operator and display units are usually fitted on the ship's bridge or bridge wings. The low wiring cost also offers the possibility of mounting appropriate connector outlets, e.g. on deck, so that the bow thruster can be operated from there with a mobile unit, if required.

The front face of the equipment consists of a powder-coated, black aluminium plate, which is sealed on top by a membrane and on the underside with an O-ring against the console. These measures ensure that the front face meets protection class IP 67.

The input keys are illuminated and are automatically dimmed in response to the ambient lighting by means of a photocell. This also applies to the 10-way alarm annunciator, as well as the LCD display, which gives a 4-digit indication of motor current. The maximum dimming (darkest state) in darkness is adjustable with the "dim" key.

Like the AHD 418, this module is also based on microcontroller technology and has the following features:

- compact construction and minimal wiring costs
- serial communication with the AHD 418 central unit
- simple operation of the bow thruster
- continuous display of motor current
- programmable overcurrent limits for the individual power steps
- audible and visible signalling of all alarms
- automatic and adjustable dimming of the annunciators
- potential-free contact for combined alarm indication and external horn

3.1 Master Operator Unit and the ON/OFF Function

The AHD 419 Operator Unit has an optocoupler input which can be used to switch the system on and off under programme control. This is done by bridging terminals (11) and (12) with an external switch, or a keyswitch. The supply voltage can remain permanently switched on, if desired.

Important: This input may only be activated on **one** of the available operator units. Normally the unit on the bridge is used for this purpose. It then becomes the master operator unit, thus enabling the programming function for setting the current limit values.

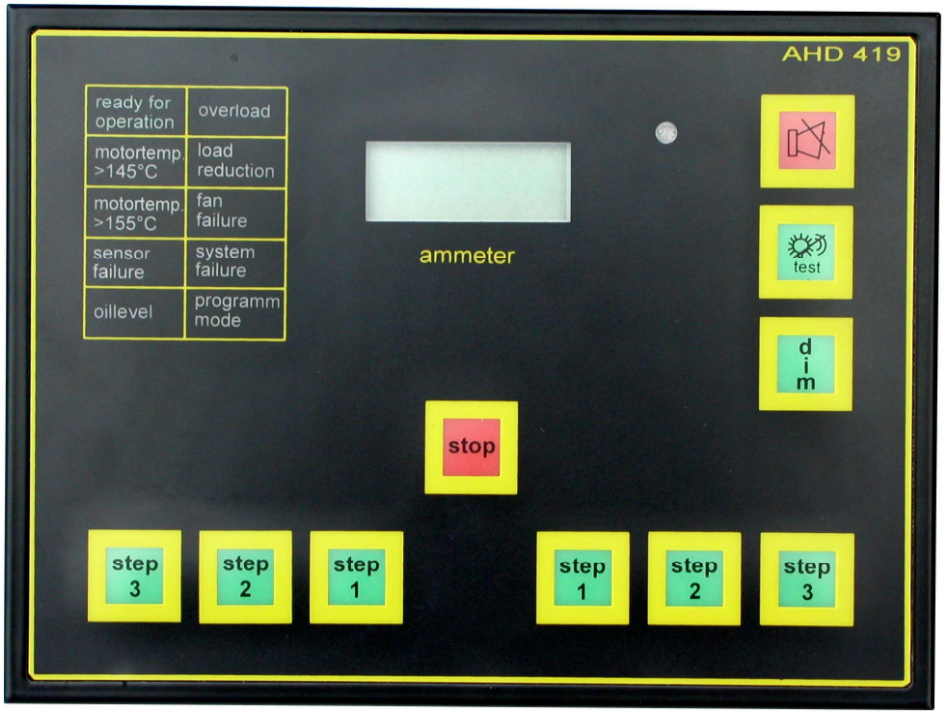
If the ON/OFF switching function is not required, the input on the master operator console must be permanently bridged.

3.2 Alarms and indicators

The AHD 419 has 10 illuminated annunciators, which, in addition to the visual indication of alarms are also intended to display status signals.

If an alarm is triggered, the relevant annunciator flashes, the internal buzzer sounds and the relay for the acoustic warning (horn relay) switches on. In the case of a sensor failure alarm, the annunciators for ‘sensor failure’ and the relevant parameter flash simultaneously. Status indications are given as a permanent light directly after activation.

Front view of the AHD 419 operator unit



Listed below are the various alarms and indications, together with their causes and supplementary information:

Alarm	Cause	Remarks
ready for operation	Power switch ON and master operator unit is ON (terminals 11, 12 bridged)	System is ready for use, provided that no serious fault has been detected
motortemp. > 145 °C	Motor winding temp. > 145 °C	Early warning
motortemp. > 155 °C	Motor winding temp. > 155 °C	System shuts down. Restart only possible by means of reset on the AHD 418.
sensor failure	Sensor failure during temperature or current measurement	Temperature: Corresponding annunciator lights. Current: LCD display shows 4 dashes "- - - -".
oil level	Motor oil level is too low	Alarm indication
overload	Motor current is too high	System reduces the power level by one step, or shuts down if step 1 (70%) was active.
load reduction	a) Step 3 blocking is active on AHD 418 b) Power reduction due to a current overload c) Power reduction due to incorrect acknowledgement from contactor.	Status signal indicates that full power is not available (max. 85%). Warning given in conjunction with overload alarm. Warning given in conjunction with system failure.
fan failure	Fan acknowledgement fails on the Alarm AHD 418	
system failure	a) Acknowledgement from a contactor fails b) Acknowledgement received without activation of a contactor.	Power reduction, until a conclusive state has been established in the AHD 418. If this is not possible, the system shuts down. System shuts down as this condition is indeterminate.
program-mode	Programming mode for setting the current limit values was selected.	Only possible on the master operator unit.

3.3 Operator controls

The AHD 419 operator unit has 7 control buttons for controlling the drive steps and a further 3 buttons for the acknowledgement functions and setting the dimmer.

a) Control buttons

Each direction of movement can be driven in 3 power steps. The associated control buttons are arranged on the front panel of the operator unit corresponding to the direction or movement. The STOP button is situated in the middle. After a button is pressed, the corresponding power step is engaged incrementally by the bow thruster. When the actual and desired states correspond, the selected power step button is illuminated.

b) Alarm acknowledgement / horn inhibit

This button on the operator unit switches off (inhibits) the horn relay and internal buzzer when an alarm is active.

c) Alarm acknowledgement / optical alarm inhibit

Operation of this key causes all flashing alarms to remain permanently lit. In addition the lamp test function is invoked, i.e. all LEDs are lit and the LCD display turns on all segments.

d) Display dimming

The maximum dimming of all LEDs in darkness can be set with this key. The photocell makes reference to this setting and then automatically adjusts the light intensity to suit the prevailing ambient brightness.

3.4 Programming the current limit values

Each power step is assigned a current limit value. When this is exceeded, an alarm is triggered after the delay period,. Programming can only be done via the master operator unit (terminals 11, 12 bridged). The procedure is described as follows:

1. Press and hold the 3 buttons ‘Horn’, ‘Test’ and ‘Dim’ simultaneously for 5 seconds, until the ‘Program-Mode’ annunciator lights. The STOP button will also light up and the LCD display will indicate the number of programming operations already carried out (P001 to P999).

2. Select from the port side the power step whose limit is to be changed. The limit that is currently in effect will now be shown on the LCD display.

3. The displayed value can be reduced with the starboard step 1 button and increased with the starboard step 3 button. The changes normally take place in 5A steps. If the starboard step 2 button is pressed simultaneously, the changes will occur in 50A steps.

4. Operation of the stop key causes the currently displayed value to be stored. As confirmation the stop key lights up again after approximately 2 sec., and the LCD display shows the number of completed programming operations. This number should be increased by 1 over the value previously indicated. The actual data (limit values) are transmitted serially to the AHD 418 control system and stored there.

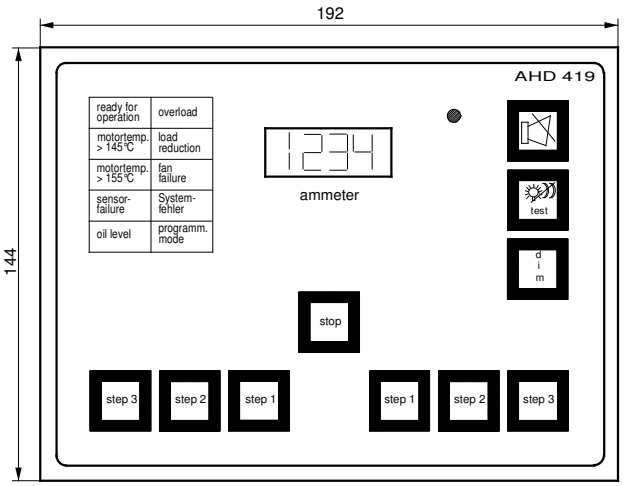
5. Further values can now be programmed as described in step 2.

6. The programming mode can be quit at any time by pressing the ‘Horn’ button.

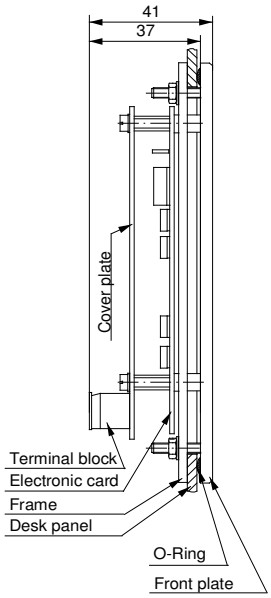
3.5 Dimensions and panel cut-out for AHD 419

41892a-e.MCD

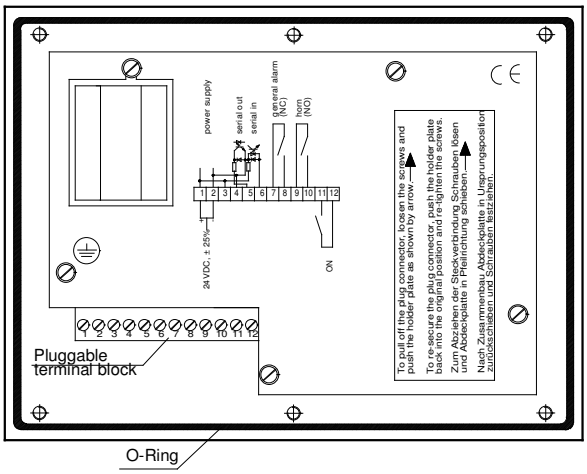
Front View

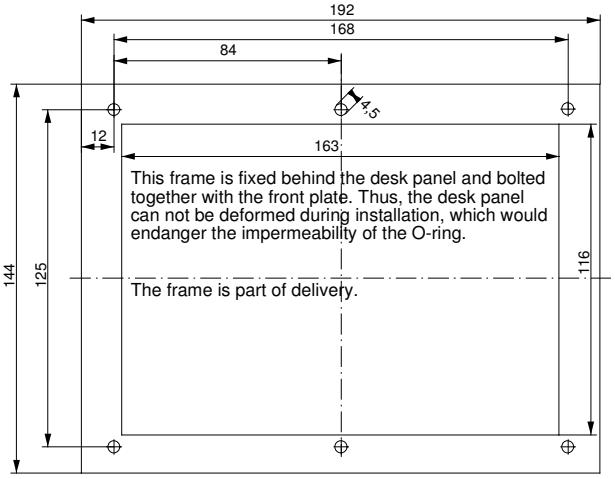


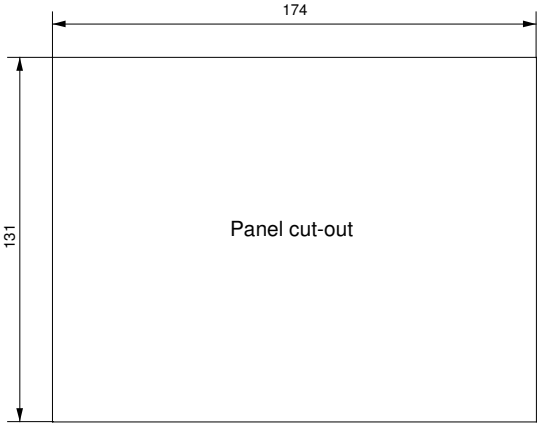
Side View



Rear View







3.6 Technical Data

Supply voltage:	24 VDC +/- 25%
Current consumption:	max. 0.2 A
Weight:	approx. 1 kg
Inputs:	2 x optocoupler for control and communication
Outputs:	2 x contact 1A, 50VDC/AC for horn and combined alarm 1 x optocoupler for communication
Operator inputs and outputs:	7 x membrane switches for command entry, with integral indicators 3 x membrane switches for cancel and dimmer functions 10 x dimmable annunciators for alarm and status indication 1 x 4-digit LCD display with dimmable lighting
Front panel protection class:	IP66 and IP67

4.0 Connecting the bow thruster control to a voyage recorder

4.1 Introduction

Because of increasingly stringent safety requirements and spectacular accidents and their investigations, ever more importance is attached to the recording and storage of data, even on ships. This also includes information from bow thruster installations, and was the reason for the development of the AHD 425 interface module. It is integrated into the equipment without affecting the existing components (AHD 418/419). Even failure of the module has no effect on the function of the bow thruster control.

Ease of fitting is possible even with already existing installations. This should also be borne in mind when planning an installation where data storage is not yet compulsory, as it may become necessary as a result of future legislation. If, for example, a conventional 'multi-core' system is installed at the time of building the ship, a retrofit becomes very expensive and will not be completed for a few hundred euros, as is the case here.

Regulation 20 of the SOLAS guidelines of January and July 2002 stipulates that the following ships must be equipped with a voyage recorder:

1. Passenger ships which were built after 01 July, 2002.
2. Ro-Ro passenger ships, which were built before 01 July, 2002 – implementation no later than at the first test/inspection/check on or after 01 July, 2002.
3. Passenger ships, other than Ro-Ro passenger ships, which were built before 01 July, 2002 - implementation no later than 01 January, 2004.
4. Ships, other than passenger ships, of 3,000 Gross Register Tons and over, which were built on or after 01 July, 2002.

In accordance with IMO 5.4.11, commands and acknowledgements must be recorded. In our case this means:

ON/OFF
Direction of travel
Power step

The AHD 425 sends a range of additional information which can likewise be stored, if desired (see page 20, 4.7).

4.2 Design

The AHD 425 is microprocessor-controlled module with 5 serial inputs for data aquisition and an RS422 data output for connecting to a voyage recorder, or some other recording device. The module is designed for rail mounting (TS32 and TS35). The AHD 425 consists of a printed circuit board containing the control electronics and the necessary interfaces. All connections are made by means of a 24-way pluggable terminal strip, the sockets of which are soldered into the printed circuit board.

4.3 Function

The purpose of this module is to acquire the data from all the implemented functions of the bow thruster control, to convert them to an IEC-61162-1 compliant protocol, and to transmit them via the RS422 interface.

The AHD 425 module monitors the data traffic between the bow thruster system and AHD 418/AHD 419. The data from the central control module AHD 418 represent the actual condition of the system. The data from the operator units AHD 419 are recorded as the desired states. Up to 5 serial data streams can be handled. The data from the control module AHD 418 and a maximum of 4 AHD 419 control units are simultaneously processed, converted to a dedicated IEC 61162-1 compliant protocol (see p. 20) and transmitted via the RS422 interface. Galvanic insulation of the RS422 interface avoids problems with cross-coupling or potential differences.

The complete record consists of an ASCII text line and is sent immediately after any change in status. If nothing changes in the status, then a periodic output is made after a DIP switch settable time interval (see 4.4.3). The record can then be stored, read and analysed by, for example, a voyage recorder.

For correct analysis, the AHD 425 module requires information about the number of operator units connected. This number is similarly set by means of DIP switches (see 4.4.3).

4.4 Installation and commissioning

4.4.1 Fitting

The AHD 425 module is best mounted in the bridge console, where the terminals are then available for simultaneous distribution to the AHD 418 central control module and the AHD 419 operator units (see last page of this document). It is mounted on an existing TS32/TS35 rail. To avoid lateral movement, e.g. by mechanical vibration, commercially available mounts can be used, or if necessary a ground terminal on one side.

4.4.2 Equipment wiring

The serial connections of all the modules are looped through the AHD 425, which also distributes the power supply.

In most applications, 3 operator units for port, bridge and starboard respectively are envisaged. The front panel legend is laid out with this in mind, i.e. the connections can be implemented exactly as per the connection diagram. The AHD 419 option terminals are unused. The number of operator units must be set to 3 with the DIP switches (see 4.4.3). If only 2 operator units are used, then the connections for port and bridge are to be used. The number is then set to 2. If only 1 operator unit is used, then this must be connected to the bridge terminals and the number set to 1.

4.4.3 DIP switch setting

Prior to installation, the DIP switch settings must be checked and reset if necessary. Switches 1 and 2 set the number of attached operator units (1...4). Switches 3 and 4 set the cycle interval within which the equipment sends messages via the RS422 interface. This time interval applies if no changes in status occur. Should one of the data sources fail, the intervals can be greater than indicated.

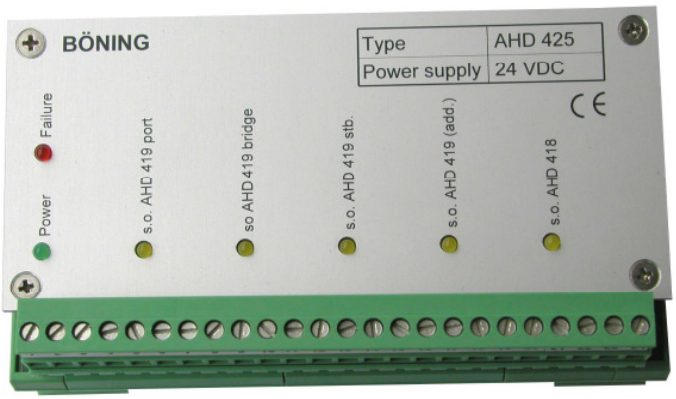
The following settings are provided for:

Switch 1 = OFF	Switch 2 = OFF:	1 Operator Unit AHD 419 (Bridge)
Switch 1 = ON	Switch 2 = OFF:	2 Operator Units AHD 419 (Bridge, Pt)
Switch 1 = OFF	Switch 2 = ON:	3 Operator Units AHD 419 (Bridge, Pt, Stbd) ***)**
Switch 1 = ON	Switch 2 = ON:	4 Operator Units AHD 419 (Bridge, Pt, Stbd, Opt.)

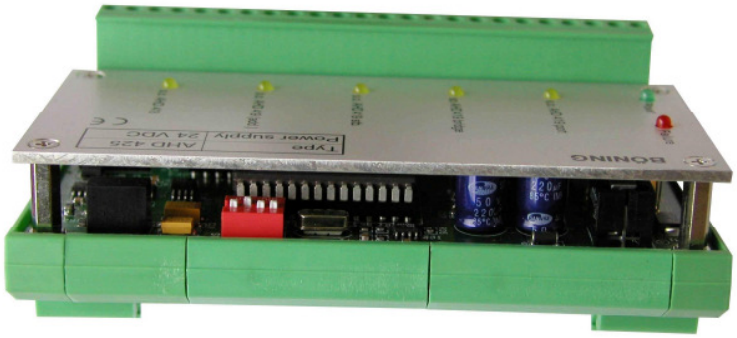
Switch 3 = OFF	Switch 4 = OFF:	Cycle interval = 10 sec.***)**
Switch 3 = ON	Switch 4 = OFF:	Cycle interval = 30 sec.
Switch 3 = OFF	Switch 4 = ON:	Cycle interval = 60 sec.
Switch 3 = ON	Switch 4 = ON:	Cycle interval = 1 sec. (Test only)

***)** Factory default settings

Front view



View of the red 4-way DIP switch

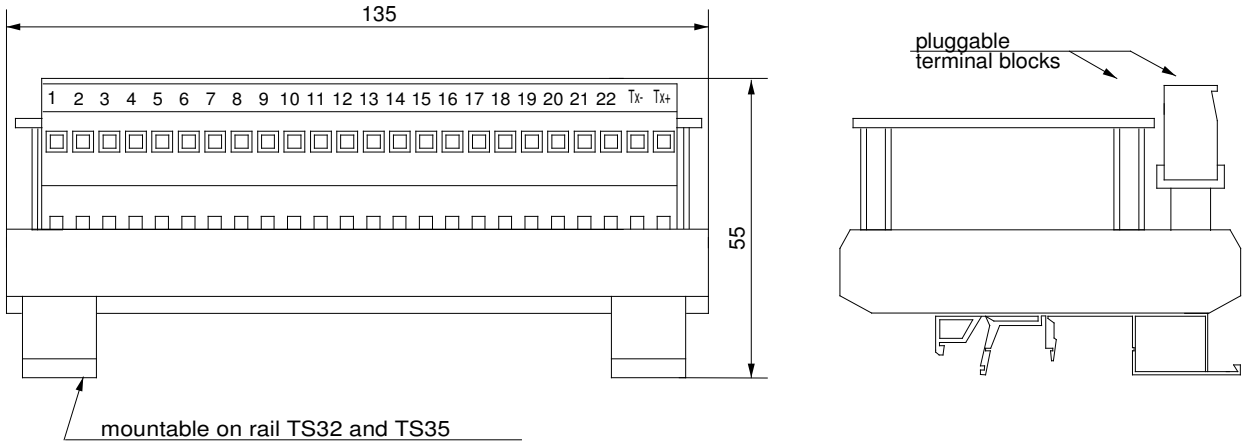


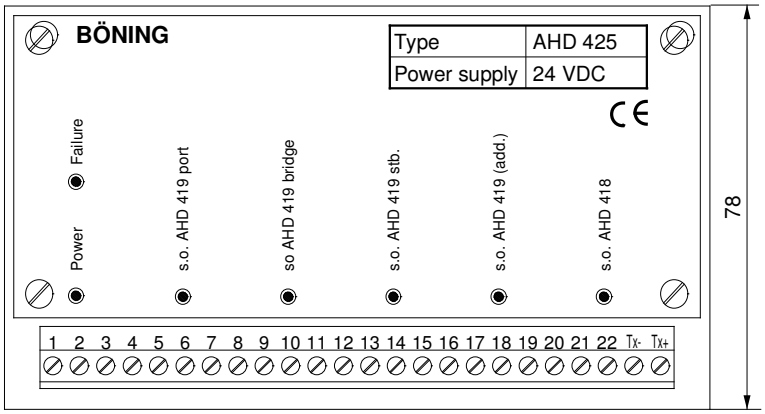
4.5 Technical data

Inputs:	5 x serial I/P optically insulated (min. 1 kV)
Outputs:	1 x RS422 galvanically insulated (min. 1 kV) RS232 interface also available on request
Supply:	18 – 30VDC, max. 0.5 A
Protection class:	IP00

4.6 AHD 425 dimensions

4899b-e.mcd





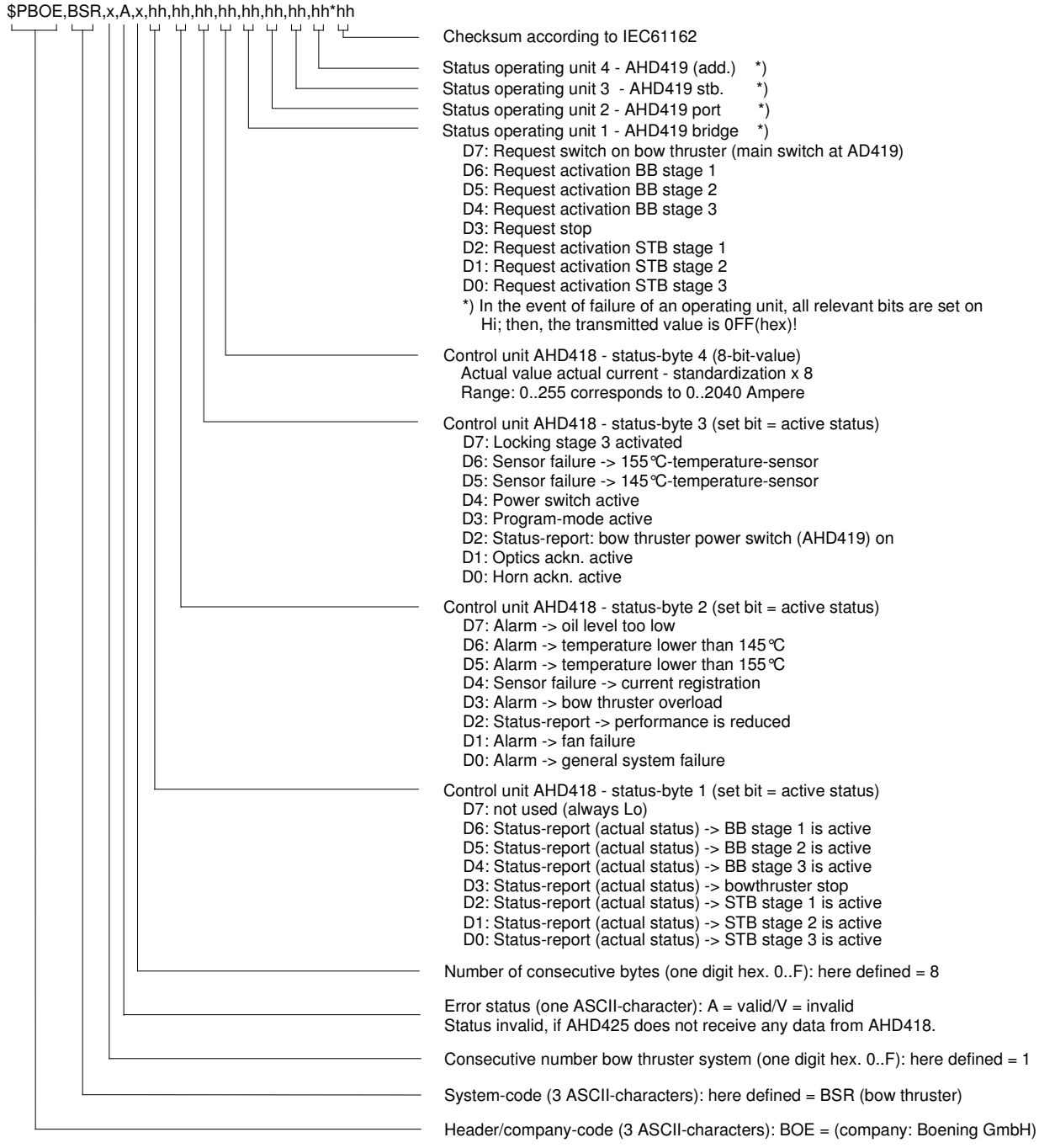
4.7 Serial output protocol

ahd425e.mcd

The actual value of the bow thruster, as well as the requests from the operating units for the nominal values, are registered with Module AHD425 and put out over an RS422-interface. Data output is done serially according to IEC 61162-1 (proprietary protocol).

Interface: RS422 galvanically separated (min. 1kV)/4800 Baud/8 Data/1 Stop (scheduling is done by the recipient)

Record layout/protocol:

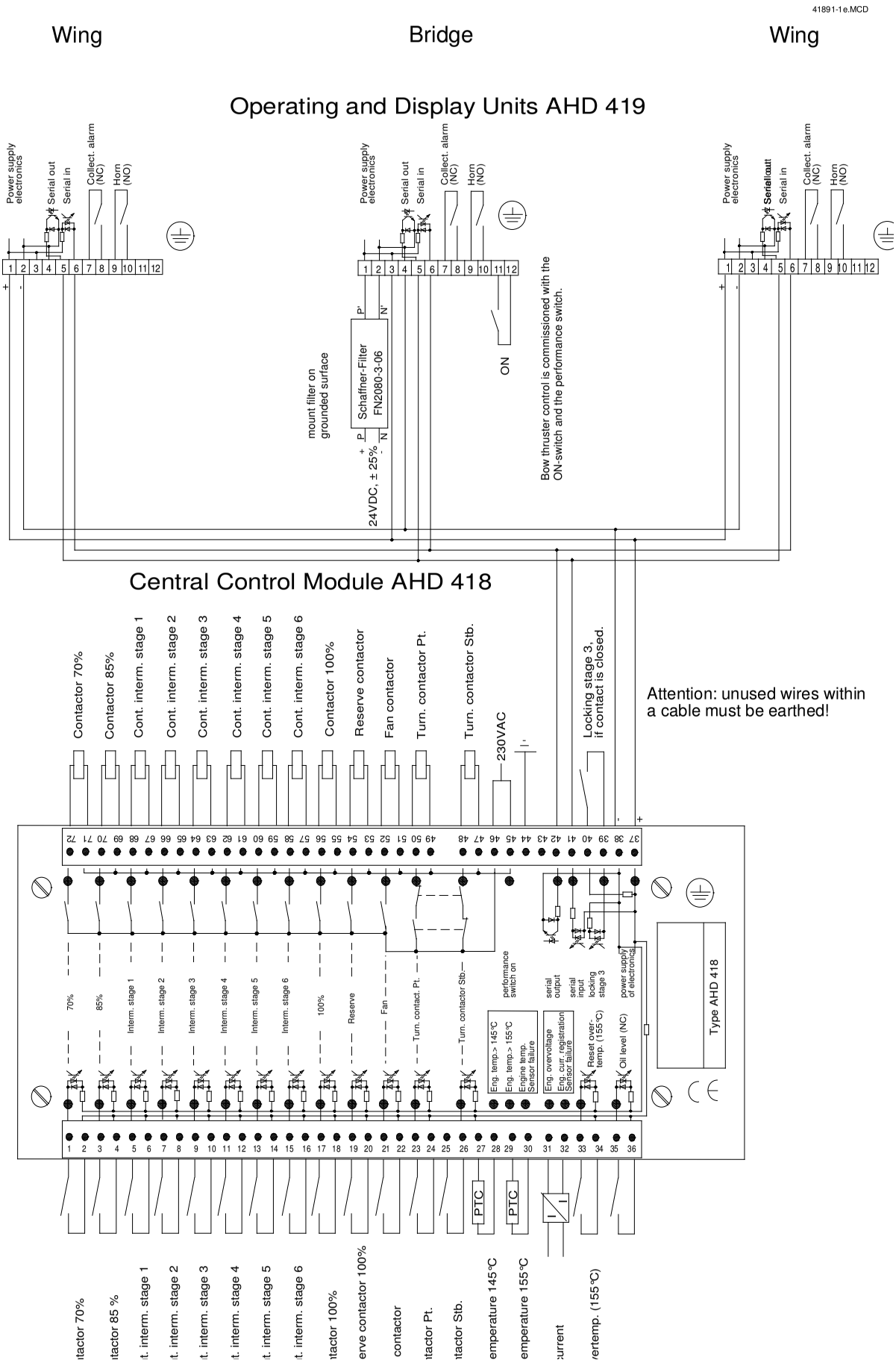


- Each record is finished with <CR> and <LF> (0Dh,0Ah).

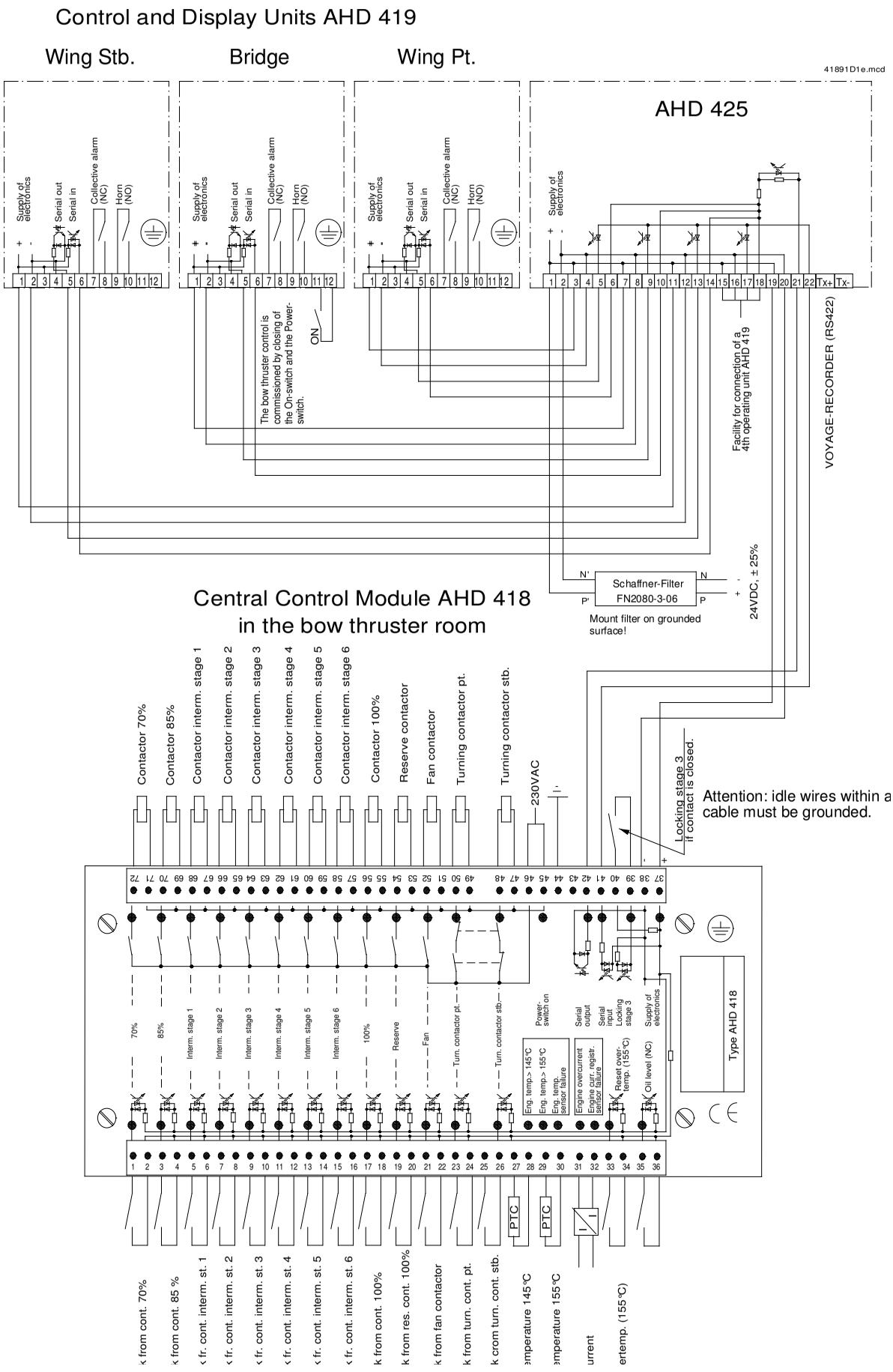
Example 1: $PBOE,BSR,1,A,8,08,00,14,00,80,00,00,00*16 => Basic status after activation: (system stop, power switch active, main switch is on, current = 0, request main switch on from bridge (operating unit 1)

Example 2: $PBOE,BSR,1,A,8,20,00,14,37,80,00,00,00*18 => System is running on port stage 2, current = 470..447 Ampere

5.0 Connection diagram for installations without a voyage recorder

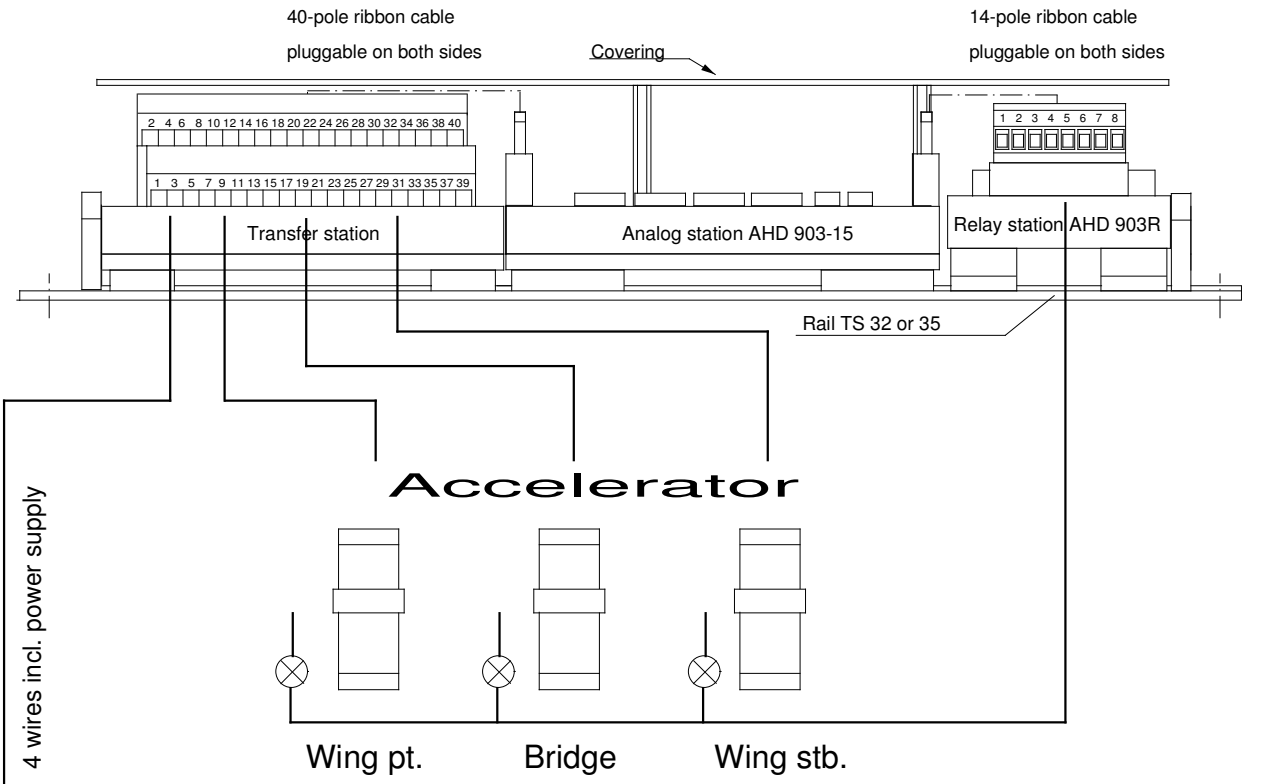


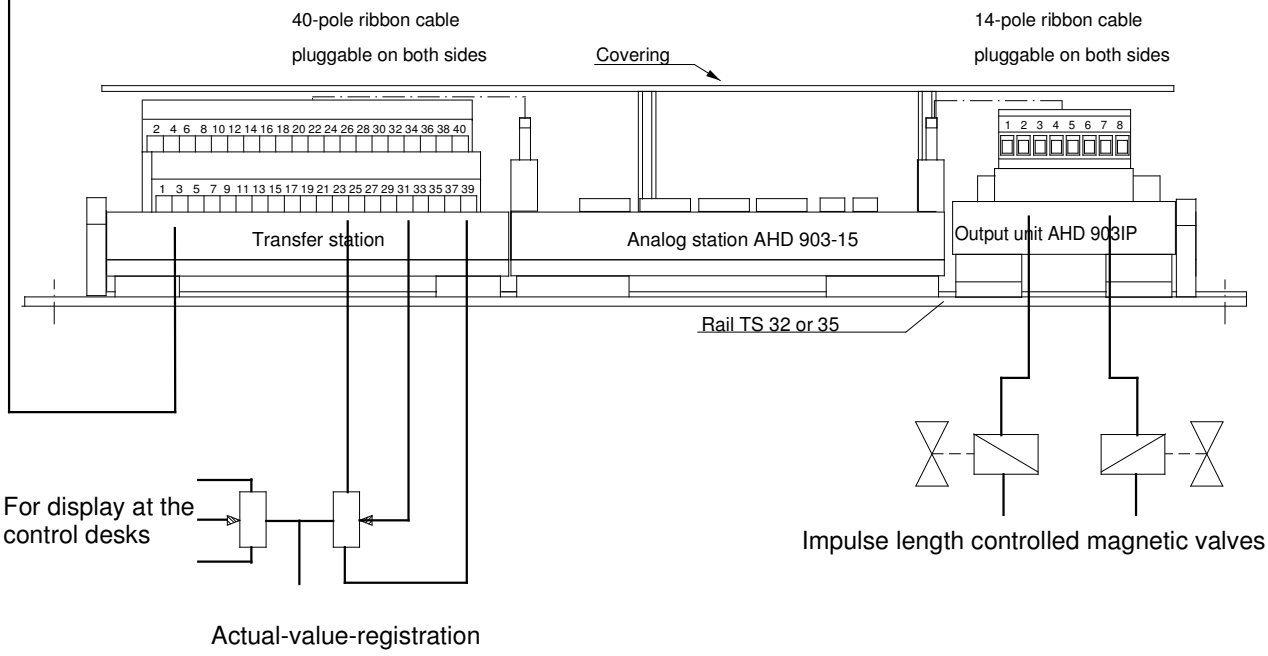
5.1 Connection diagram for installations with a voyage recorder



bugvs-e.mcd

BOW THRUSTER CONTROL WITH VARIABLE PITCH PROPELLER AHD 903BS





BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

Control for bow thruster with variable pitch propeller
AHD 903BS

903bsi-e

Contents

	Page
1. Construction	3
2. Control units	3
3. Bow thruster	4
4. Failure report	4
5. Commissioning	4
Terminal diagram	8
Dimensional drawing	9
Technical data	9

Control for bow thruster with variable pitch propeller
AHD 903BS

1180-1i-e.DOC

1. Construction

The system for controlling a bow thruster with variable pitch propeller consists of two units. The operating unit for the three control units is located on the bridge, the control unit for propeller adjustment at the bow thruster. Both units communicate serially with each other and are connected by means of four wires (incl. power supply). They consist of similar analogue data stations AHD 903-15. An additional relay module AHD 903R is used on the bridge and a module AHD 903IP, as well as two further relays, are used for impulse length control on the bow thruster side.

2. Control units

The operating unit on the bridge receives the inputs from the main control unit, as well as from two wing control units on port and starboard. The default angle for propeller adjustment is registered and evaluated by means of a potentiometer (joystick with 0-positon in the middle).

Following activation, the system can only be operated from the bridge control unit. Prior to propeller drive being engaged at the bow thruster side (relay K3), the selector switch for operation has to be in position ‘bridge’ and the potentiometer has to be in position ‘0’ (micro-contact). As long as these conditions are not fulfilled, the lamp ‘ready for operation’ at the bridge control unit signalises this by slow flashing in a 1.5-seconds-cycle. Once the start function is enabled, the flashing light becomes permanently illuminated.

Adjustment of the bow thruster angle is carried out by means of a 3-point follower by comparison of target value (joystick) and actual value (controller at the bow thruster).

If, during operation, manoeuvering shall be continued from one of the wing control units, the selector switch for operation at the main control unit has to be switched into the appropriate position (port or starboard). Then, the takeover-button at the wing control unit has to be pushed, which causes the lamp ‘ready for operation’ to flash. Actual takeover does not take place until the target value at the wing control unit (joystick position) is the same as the actual value recorded. As long as this is not the case, operation of the bow thruster will be continued from the bridge control unit, even if the selector switch for operation is in starboard or port position. When the conditions for takeover at the wing control unit are fulfilled, the flashing lamp ‘ready for operation’ lights permanently and the system can now be operated from the wing. If synchronisation between target and actual value has not taken place within ten minutes, the flashing lamp ‘ready for operation’ at the wing control unit is extinguished. In this case, the takeover operation would have to be repeated.

Feedback of the command inputs from wing to bridge is carried out in the same way as described above. The selector switch for operation has to be switched into position ‘bridge/main control unit’ and the takeover button has to be depressed. Once again, for correct takeover the target value must correspond to the actual value.

Each control unit indicates the actual value of the propeller angle. For safety reasons, this signal is led separately from the system and activated directly by the actual value potentiometer at the bow thruster.

3. Bow thruster

On the bow thruster side, the target value settings are received serially by the operating unit and the relevant proportional magnet valves are activated via a servo governor (impulse length control). The actual analogue value of the propeller angle is fed back and evaluated.

If the difference between target and actual position is too great, the relevant transistor output (increase or decrease angle) will provide maximum power. The actual value now tracks and approaches the target value. Within this now narrow range, the two proportional solenoid valves are activated by the impulse lengths, leading to a stable condition when the system is deactivated (actual value = target value).

This narrowed range must be regarded as positive and negative offset around the actual value. Its prescribed value corresponds to a certain angle which can be adjusted by means of 6 DIP switches on the circuit board in the terminal box. Two criteria have to be considered:

a) The smaller the range chosen, the more precisely the actual value is adjusted to the target value.

b) On the other hand, the value chosen should be high enough to allow compensation (in the relevant system) for deviations within the narrowed range caused by possible oil leakages.

The solenoid valves do not open until a minimum current is reached. The minimum current is usually 20% of the rated current. This minimum current can be adjusted with a special DIP switch.

a) Level 1 = 16% minimum current, which means that the valve is still closed at the start of the control range.

b) Level 2 = 24% minimum current, which means that the valve is always opened a little at the start of the control range.

The solenoid valves are only activated in connection with enabled start function. The conditions for enabled start function are as described above.

4. Failure report

Relay K4 serves for failure report at the bridge side, as well as at the bow thruster side. An open contact signalises a failure, missing configuration (see setup) or wire breakage and can thus be evanluated or indicated correspondingly. Additionally, in case of failure, the start release is cancelled and the solenoid valves are switched to idle.

5. Commissioning

In order to make the system ready for operation, it has to be programmed via the integrated adjustment software. If programming has not yet been done, the system can not work. In this case, the failure relay K4 is activated when the device is switched on and the lamp ‘ready for operation’ on the bridge flashes in a 5-second cycle: one second on, four seconds off. Thus, the user is reminded optically to do the programming.

On request, the system can be pre-configured ex-works. Thus, the system is ready for operation immediately after switching on, but this is only feasible if the exact adjustment values are known (e. g. for replacement parts provided the adjustment values are known).

During programming, the target and actual value positions of the potentiometers are coordinated. For this purpose, the limit positions of the adjustable pitch propeller have to be reached and the corresponding positions of the potentiometers have to be saved. Please programme as follows:

1. Switch off power supply. To activate the programming mode, terminals 37 and 38 of the unit which is installed on the bridge have to be connected via a jumper.

2. Now switch on the power supply. The lamp ‘ready for operation’ on the bridge control unit should flash rapidly with two flashes per second. This signalises the activated programming mode.

3. The selector switch for operation from the bridge control unit is now turned to position ‘port’ to adjust to the first limiting position. ‘Port’ now stands for max. negative propeller angle.

4. Correspondingly, now the max. negative propeller angle is directly adjusted by manual or emergency control of the bow thruster.

5. Then, the target value controllers (joysticks) of all three control units are switched into position ‘max. negative propeller angle’ (bottom position).

6. After rechecking the three previous instructions, the relevant controller positions for this limiting position can now be saved. For this purpose, the takeover-button in the bridge control unit has to be depressed for approx. 1 sec. After releasing this button, the lamp ‘ready for operation’ lights up for approx. 2 sec., providing optical acknowledgement of programming.

7. To adjust the second limiting position, the selector switch for operation is switched to position ‘starboard’ (‘starboard’ now indicates max. positive propeller angle).

8. Now the max. positive propeller angle is adjusted by manual or emergency control.

9. The controllers (joysticks) of the three control units are then adjusted to the corresponding position “max. positive propeller angle” (top position).

10. The programming of this limiting position is now carried out as described under 6 above. (depressing the takeover-button for approx. 1 sec.).

11. Finally, the neutral position is adjusted. For this purpose, the selector switch for operation is switched to position ‘bridge’ (‘bridge’ now indicates neutral position).

12. Now, the neutral position (angle = zero) is adjusted by manual or emergency control.

13. The potentiometers (joysticks) of the three control units are adjusted to positon ‘angle zero’. While doing this, the programmer should check that the micro-switch mechanically linked with the bridge control really closes at ‘neutral position’, as otherwise the neutral position can not be adjusted.

14. Programming of the neutral position is now carried out as described under 6 above. (depressing the takeover-button for app. 1 sec.). If there is no optic acknowledgement (light on for 2 sec.), the micro-switch ‘neutral position’ at the controller of the bridge control unit is not closed. Please check again.

15. The jumper between terminals 37 and 38 is now removed to exit the programming mode. The power supply can remain switched on during this procedure. In case of correct programming, normal operation starts immediately.

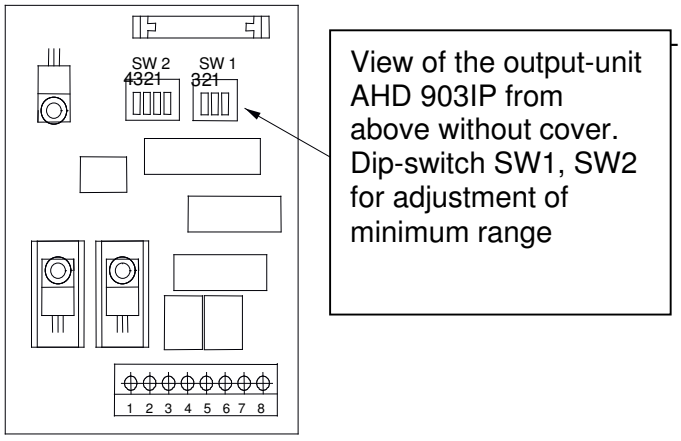
Following each programming step and every activation, the software checks the conclusiveness of all programmed adjusting values. If they are not conclusive (e.g. min. value higher than max. value), the failure relay K4 is activated and the lamp ‘ready for operation’ flashes in a 5-second cycle; 1 sec. on, 4 sec. off.

Possible mistakes are, e.g. wrong wiring of the exterior controller connections (at max. positive propeller angle the voltage at the slider has to be higher than in the neutral position) or incorrect use of the selector switch (operation), whose labelling has a different meaning during programming. In the event of such a mistake, the whole programming procedure has to be repeated. The same applies if there is a power failure during the programming phase.

If necessary, a new adjustment can be carried out later at any time. Here, it is also possible to program only single positions, e. g. only position angle zero --> following instructions 1, 2, 11 to 15.

If the saved adjustment parameters are to be written down, the installed EEPROM has to be removed and read with a separate programming device.

DIP-Switch on Additional Module AHD 903IP



The extent of the narrowed range can be specified qualitatively as binary value with 6 DIP-switches in a range of 0-63. The value is proportional to the adjustable angle and has to be adjusted interactively depending on the overall arrangement. The narrowed range is adjusted to the value 32 ex works.

DIP-switch values:

ON = binary low
OFF = binary high
SW1 – switch 2 corresponds to the most significant byte (value = 32)...
SW2 – switch 4 corresponds to the least significant byte (value = 1)

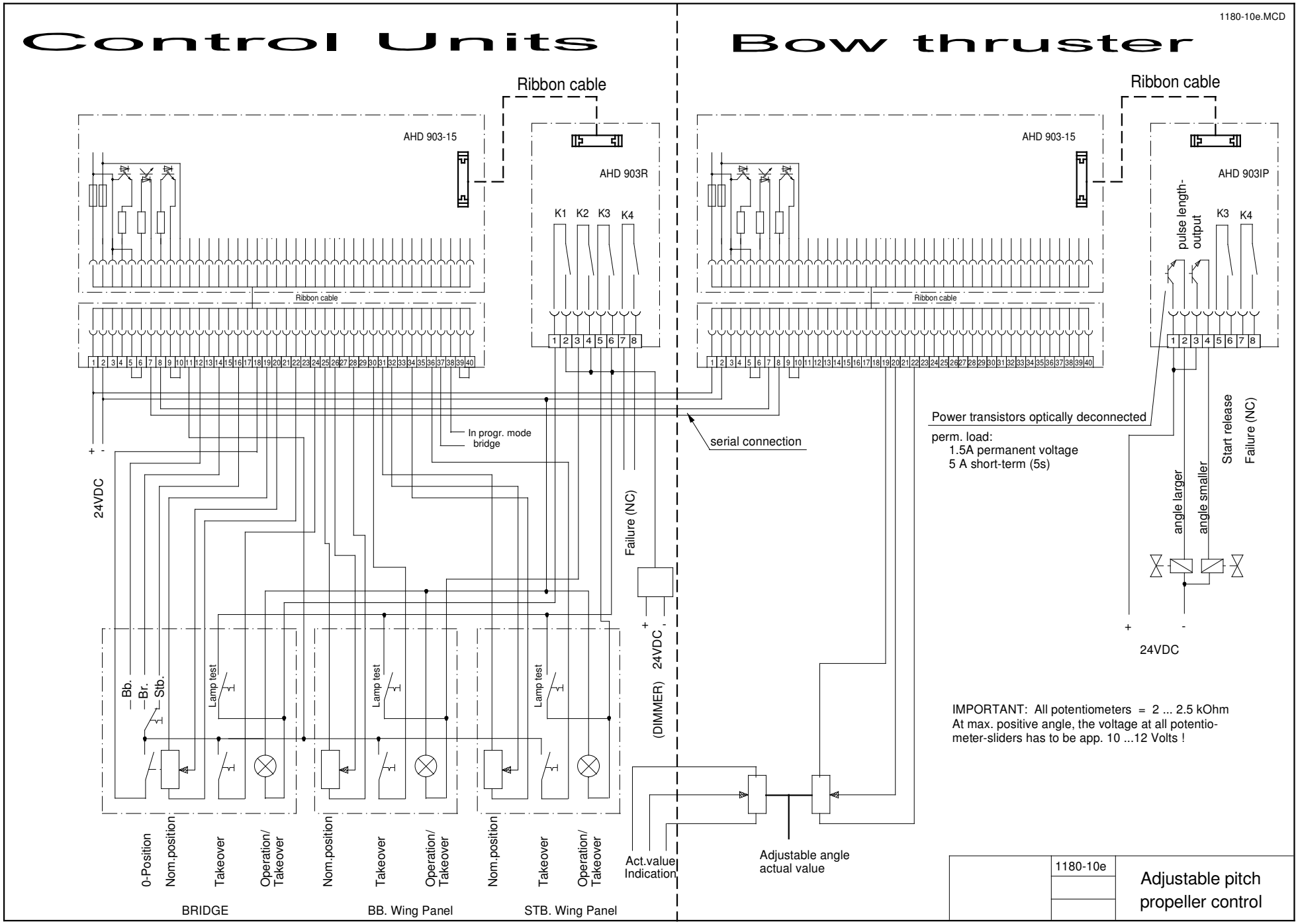
Example:

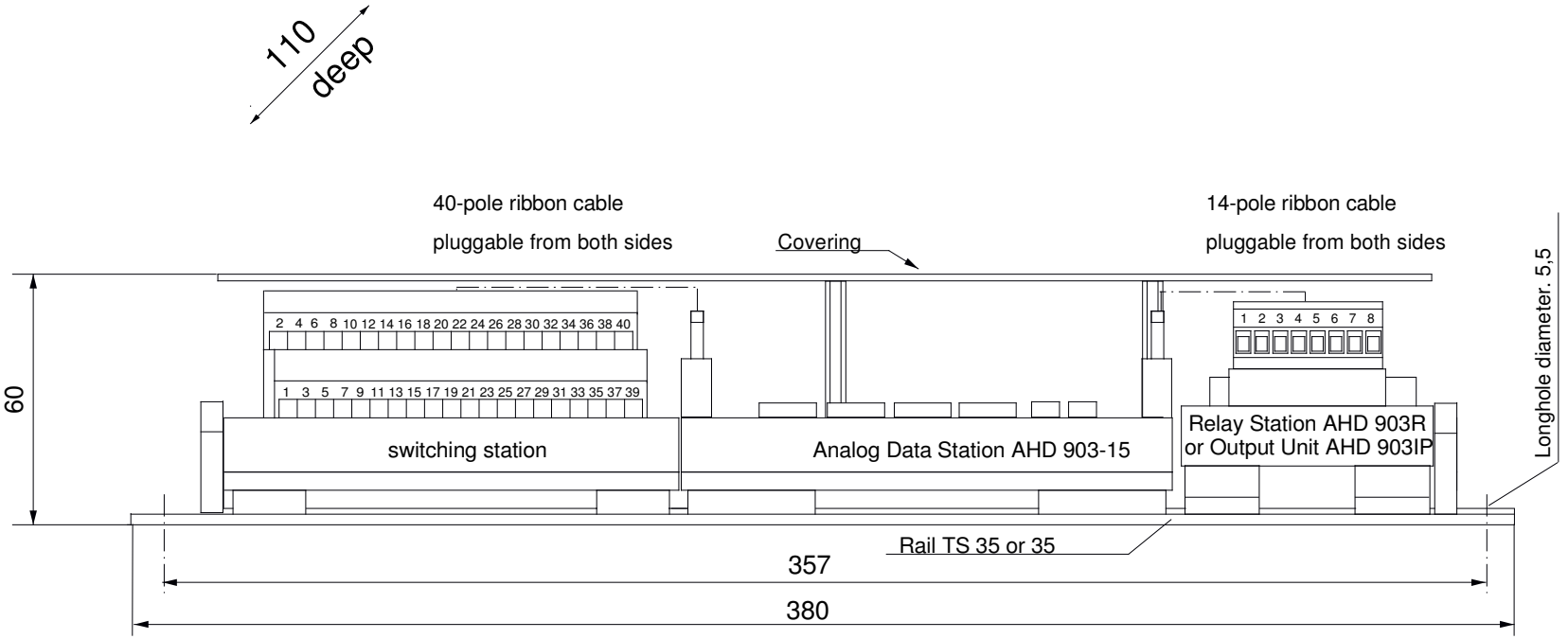
SW1-S2(32)	= OFF	Byte = High	Proportion of total value = 32
SW1-S3(16)	= ON	Byte = Low	No proportion
SW2-S1(8)	= OFF	Byte = High	Proportion of total value = 8
SW2-S2(4)	= OFF	Byte = High	Proportion of total value = 4
SW2-S3(2)	= ON	Byte = Low	No proportion
SW2-S4(1)	= OFF	Byte = High	Proportion of total value = 1

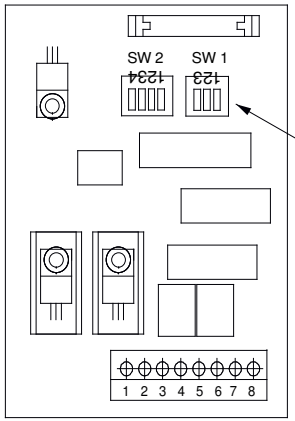
Therefore, the total value of the narrowed range is 45.

The min. current for the proportional solenoid valves is adjusted with the SW 1 - switch 1:

ON Imin = 16% of target current
OFF Imin = 24% of target current


1180-10e.MCD
Control Units
Bow thruster
Ribbon cable
AHD 903-15
AHD 903R
K1 K2 K3 K4
Ribbon cable
1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
In progr. mode bridge
serial connection
+ -
24VDC
Failure (NC)
+ - 24VDC (DIMMER)
Bb.
Br.
Stb.
Lamp test
Lamp test
Lamp test
0-Position
Nom.position
Takeover
Operation/ Takeover
Nom.position
Takeover
Operation/ Takeover
Nom.position
Takeover
Operation/ Takeover
BRIDGE
BB. Wing Panel
STB. Wing Panel
Act.value Indication
Adjustable angle actual value
Ribbon cable
AHD 903-15
AHD 903IP
pulse length-output
K3 K4
Ribbon cable
1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Power transistors optically deconnected
perm. load:
1.5A permanent voltage
5 A short-term (5s)
angle larger
angle smaller
Start release
Failure (NC)
+ -
24VDC
IMPORTANT: All potentiometers = 2 ... 2.5 kOhm
At max. positive angle, the voltage at all potentio-meter-sliders has to be app. 10 ...12 Volts !
1180-10e
Adjustable pitch propeller control





View of Output Unit
AHD 903IP from above
without covering.

DIP-switch SW 1, SW2
for adjustment of the near-limiting-value-range

TECHNICAL DATA:

Power supply	: 24VDC +/-25%
Power cons. of electronics	: app. 0.15 A
Perm. load of relay contacts	: 1 A
Perm load of transistors	: 1.5 A permanent current, 5A short-term (5s)
Inputs	: 15 x analog/binary
Serial interface	: 1 x TTY bidirectional (current loop)
Perm. rel. air humidity	: 99%
Weight	: 1.5kg

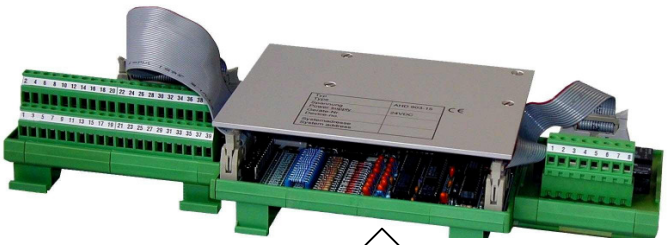
	903ver-e	Control for bow thruster AHD 903BS with adjustable pitch propeller

EXHAUST GAS AVERAGE VALUE CONTROL FOR DIESEL ENGINES

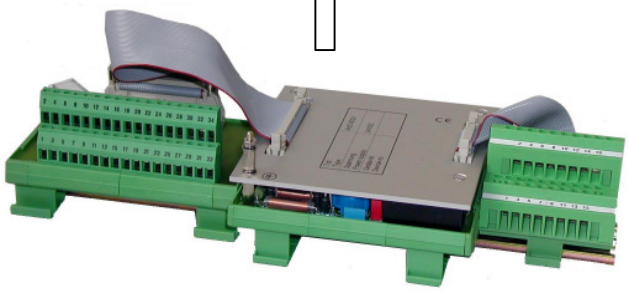
abgmkat.doc

EFFICIENT MODULAR FLEXIBLE ROBUST EASY INSTALLATION ECONOMIC

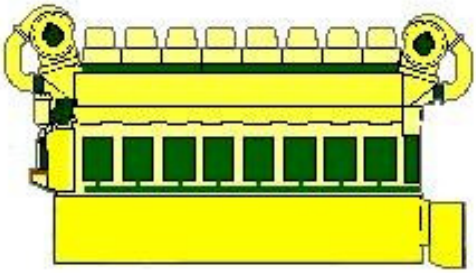
LCD-monitor **AHD 524** for console installation with front dimensions of 194mm x 146mm; for display of all relevant exhaust gas data on one page; one page per engine for more than one engine drive. Pages called up via +/- keys. Degree of protection IP 54 is obtained.



Data station **AHD 903-15** for rail mounting; with connected relay unit AHD 903-R**;** for calculation of exhaust gas temperatures with ambient temperature compensation and average value divergence, minimal and economic wiring due to serial data transmission to monitor AHD 524 by means of only 4 wires including power supply; **Device is approved by GL for installation in engine terminal box.**



Amplifier unit **AHD 903V** for rail mounting; for amplification of up to 14 thermocouplers NiCrNi and transmission of voltages to data station AHD 903-15; **Device is approved by GL for installation in engine terminal box.**



Diesel engine with NiCrNi thermocouplers for exhaust gas temperature measurement (other sensors on request).

BÖNING Automationstechnologie

Development, manufacturing, service for shipping and industry
Böning Automationstechnologie GmbH & Co. KG • Am Steenöver 4 • D-27777 Ganderkesee
Phone: +49(0)4221 9475-0 • Fax: +49(0)4221 9475-22 • Internet: www.boening.com • E-Mail: info@boening.com

EXHAUST GAS AVERAGE VALUE CONTROL SYSTEM FOR DIESEL ENGINES

CONTENTS

		Page
1.	General features	3
2.	Design	3
3.	Function	3
3.1	Amplification of thermovoltages	3
3.2	Processing of amplified thermovoltages	3
3.3	Display on the monitor	4
3.4	Sensor failure	5
3.5	Relay functions	5
4.	Arbitrarily selectable parameters of the exhaust gas average value control system	5
5.	Description of the single devices	6
5.1	Thermocoupler amplifier AHD 903 V	6
5.2	Analogue data station AHD 903-15	8
5.3	LCD-monitor AHD 524	10
5.3.1	General features	10
5.3.2	Construction of device	10
5.3.3	Function	10
5.3.4	Interfaces	11
6.	Commissioning of the exhaust gas average value control system	13
6.1	General features	13
6.2	Activating the system	13
6.3	Programming by means of external keyboard type PC Mini 5	13
Measuring point list		17
Terminal diagram		18

1. General features

The exhaust gas average value control system for diesel engines is part of the decentralized alarm system DZA 02 and is of modular construction. It is highly flexible, of small dimensions and is easy to install (also in existing systems). Due to the application of standard devices and serial data transmission, it is very economic. Within any one system, 14 measuring points can be processed, e.g. 12 cylinders plus one in front of and one behind the turbocharger. For engines with more measuring points (e.g. 16-cylinder V engines), just one side of the engine is considered to be a complete engine.

2. Design

A typical system with NiCrNi-thermocouplers for temperature sensors comprises the following components:

- **Amplifier unit AHD 903V** for amplification of up to 14 NiCrNi-thermocouplers by factor 100

- **Data station AHD 903-15** for registration of the amplified thermovoltages and calculation of all relevant parameters, as well as for ambient temperature compensation with a temperature sensor that is included as standard.

- **Relay unit AHD 903R** for distribution of the following selectable information (see measuring point list):

  exhaust gas average value divergence
  cylinder temperature max.
  temperature exceeded in front of or behind turbocharger
  collective alarm

- **LCD-monitor AHD 524** for display of all relevant exhaust gas average temperatures and/or their limiting values.

- **Membrane keyboard** for setting of limiting values, e.g. during commissioning.

3. Function

3.1 Amplification of thermovoltages

The amplifier unit AHD 903V amplifies the thermovoltages by a factor of 100. That means that a temperature divergence range of 0°C to 600°C between the thermocouplers and the terminal block of the amplifier results in an output voltage of 0 V to 2.49 V. To determine the actual exhaust gas temperature, the ambient temperature has to be added. The ambient temperature is measured and analyzed by analogue data station AHD 903-15 with a sensor that is included as standard.

3.2 Processing of amplified thermovoltages

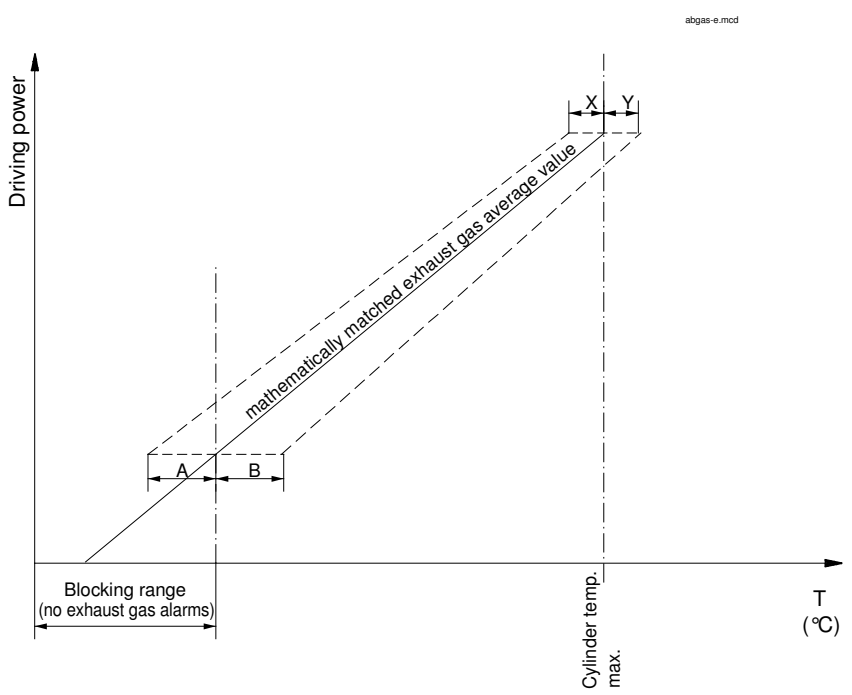
The amplified thermovoltages are transferred to analogue data station AHD 903-15. This device is equipped with a special software that operates as an exhaust gas average value control system.

All cylinder temperatures are measured and their average value is calculated. Beneath an adjustable average value temperature, the so-called blocking range starts, in which no alarm is triggered. Above this limit, the average value is compared with the permitted limiting values of plus and minus divergence. When a limiting value is reached, an exhaust gas average value alarm is released. The permitted divergences can be set arbitrarily in accordance with the exhaust gas average value temperature. Usually, in the lower value range larger divergences are permitted than for higher average value temperatures, which, when illustrated, leads to the classic trumpet-shape. At the upper end, the ‘trumpet’ is limited by the maximum permitted cylinder temperature. The position of the 4 corner points of the ‘trumpet’ can all be determined separately by setting the values A, B, X and Y (see drawing 1).

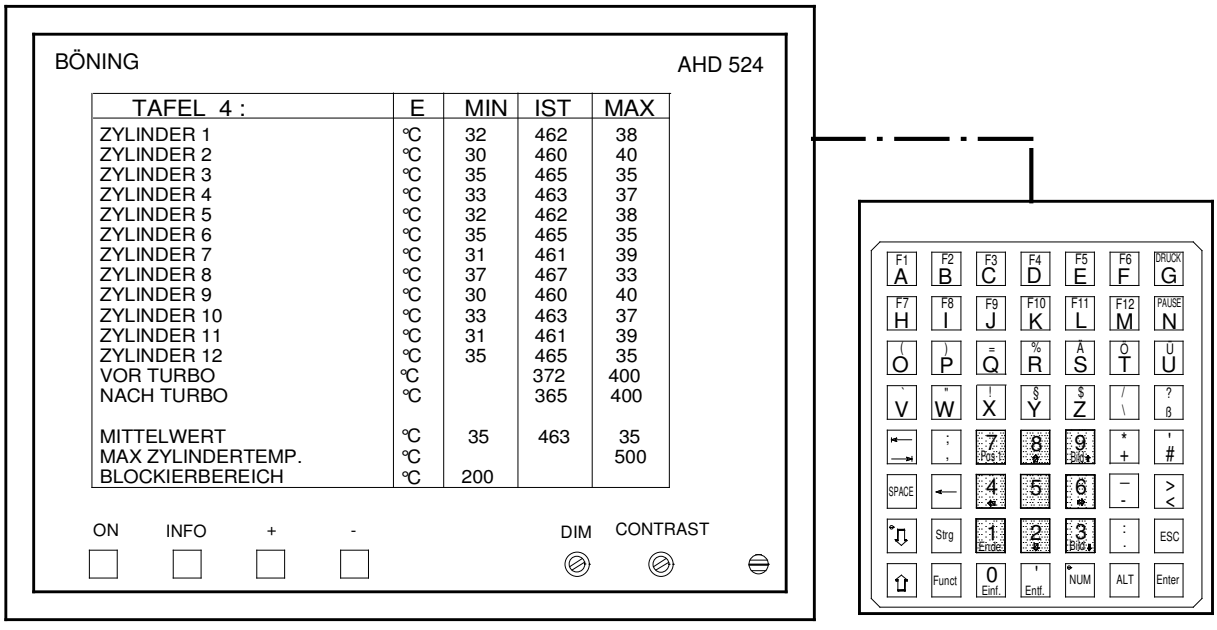
Due to unavoidable tolerances, even when engine is running smoothly, not all cylinder temperatures are equal. This has to be taken into consideration, when the exhaust gas temperatures are analyzed, by carrying out a mathematical adjustment. This should be done in the higher performance range (e.g. nominal load) and with smoothly running engine (see commissioning). At the moment of the adjustment, all cylinder temperatures are equalized mathematically and match the actual average value. Thus, false alarms are avoided. These can occur e.g. because the temperature of any one cylinder, which may already be in smooth working condition closer to a limiting curve than the average value, exceeds or falls below the alarm value.

The maximum cylinder temperatures and the maximum temperatures in front of and behind the turbocharger are also adjustable.

value control



3.3 Display on the monitor



An engine with up to 12 cylinders can be displayed on one monitor page together with the measuring points in front of and behind turbocharger. Furthermore, the actual average value temperature and the maximum permitted cylinder temperature as well as the blocking range are displayed. For engines with more cylinders, a second page is necessary. Paging on the monitor is carried out with the keys '+' and '-'. This solution can also be used for more than one engine drive. Here, not every engine has its own monitor, but every engine has its own page or pages.

The cylinder temperatures can be read in the IS-column. In the MIN-column, the gap between the relevant cylinder temperature and the exhaust gas average value alarm, is represented by a negative temperature divergence. If, in this example, the temperature of cylinder 2 were to drop by 30°C or more, this would cause an exhaust gas average value alarm. The same applies for the MAX-column in case of a positive divergence. A low value in the MIN- or MAX-column therefore indicates the danger of an average value alarm.

3.4 Sensor failure

The registration of possible sensor failures is based on the fact that, under normal operating conditions (above the blocking range temperature), a sudden, drastic fall in temperature down to values close to the ambient temperature cannot occur. In case of such a sudden fall in temperature, it can therefore be assumed that there is a wire break or a sensor failure. The relevant exhaust gas sensor is now automatically excluded from the average value calculation. The display shows the value '0'.

In case of a failure of the ambient temperature sensor, the internal processing is carried out at a simulated temperature of approx. 30°C.

3.5 Relay functions

A relay module type AHD 903R with 4 group relays is attached next to the analogue data station AHD 903-15. Both units are connected by a 14-pole ribbon cable. To each relay (k1 to k4), the following alarms can be assigned:

1. Exhaust gas average value divergence
2. Temperature in front of turbo max
3. Temperature behind turbo max
4. Cylinder temperature max
5. Collective report from 1 to 4
6. Collective report sensor failure
7. Collective report 1 to 6

Each of the mentioned relays can also be defined as normally open or normally closed. The relay is in its normal operating condition when no alarm assigned to this relay is active. Furthermore, every relay can operate as first-value indicator or new-value indicator. First-value indicator means, a relay is activated when one of the alarms assigned to it is released. If a second alarm assigned to this relay is triggered, the relay remains in the same state. New-value indicator means that in the same case the respective relay first switches back to its normal state for 2 seconds when the second alarm assigned to this relay is triggered (collective alarm repetition) and then is reactivated.

4. Arbitrarily selectable parameters of the exhaust gas average value control system

The exhaust gas average value control system is usually programmed ex works. This is based on the measuring point list that is part of the documentation and in which the customer specifies the project specific parameters. Depending on the amount of cylinders and other measuring points, the LCD-monitor is loaded with a corresponding mask before delivery. The other parameters, which are mentioned below, can also be changed later by the customer, e.g. during commissioning.

End of blocking range (start of monitoring)

maximum cylinder temperature

maximum average value divergence from end of blocking range to direction ‘plus’ (see A in fig. 1)

maximum average value divergence from end of blocking range to direction ‘minus’ (see B in fig. 1)

maximum average value divergence at cylinder temperature to direction ‘plus’ (see Y in fig. 1)

maximum average value divergence at cylinder temperature to direction ‘minus’ (see X in fig. 1)

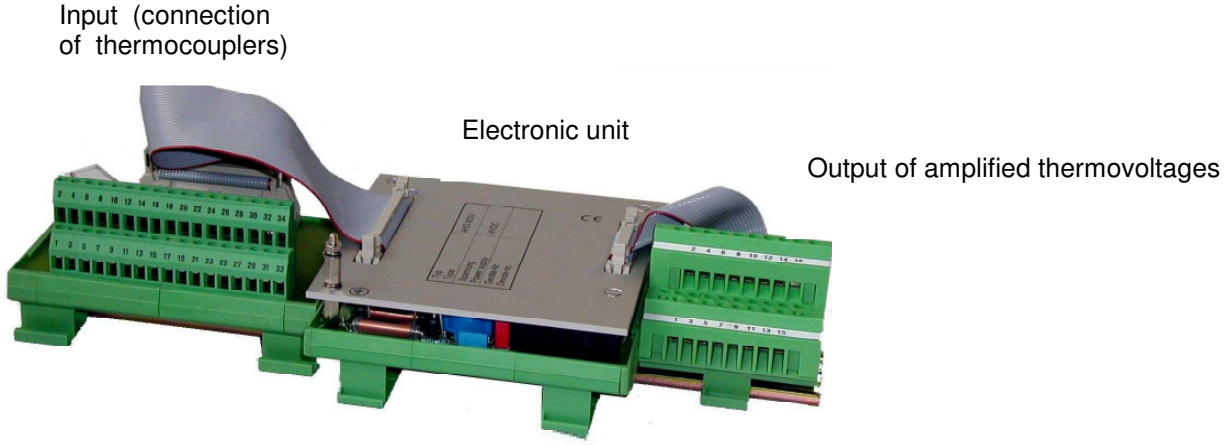
A keyboard is also included as standard and can be plugged into the rear-side of the monitor. A menu that is part of the system program of the LCD-monitor can be called up by using the keyboard. It guides the user and thus enables an easy adjustment of the parameters to the specific requirements of the system. The keyboard must also be used to carry out mathematical adjustment of the cylinder temperatures, as described under 3.2. All parameters of the exhaust gas average value control system are saved in the data station AHD 903-15 and in the LCD-monitor AHD 524. This also applies for changes made later, e.g. during commissioning. The exhaust gas average value control system will still work if the monitor is removed or defective.

5. Description of the individual devices

5.1 Thermocoupler amplifier AHD 903 V

AHD 903 V consists of 14 independent precision amplifiers. It is mostly used for NiCrNi-thermocouplers in connection with exhaust gas temperature measuring of diesel engines. The amplification factor is 100 (also see item 3.1 of this description).

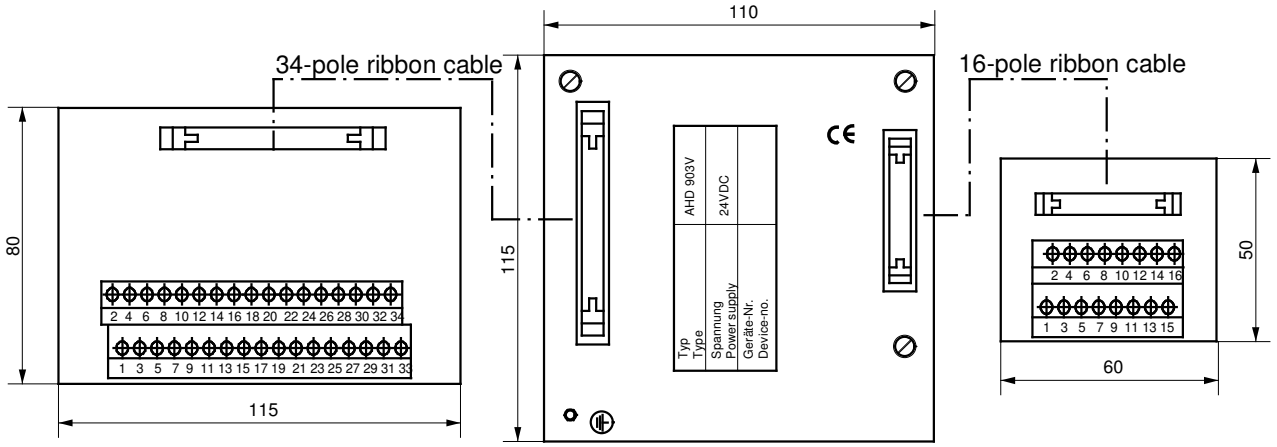
The device is designed for rail mounting and is approved by GL for installation in the engine terminal box. AHD 903 V consists of an electronic unit and one substation each for input of the thermocouplers and output of the amplified signals. Ribbon cables connect the electronic unit with the substation.



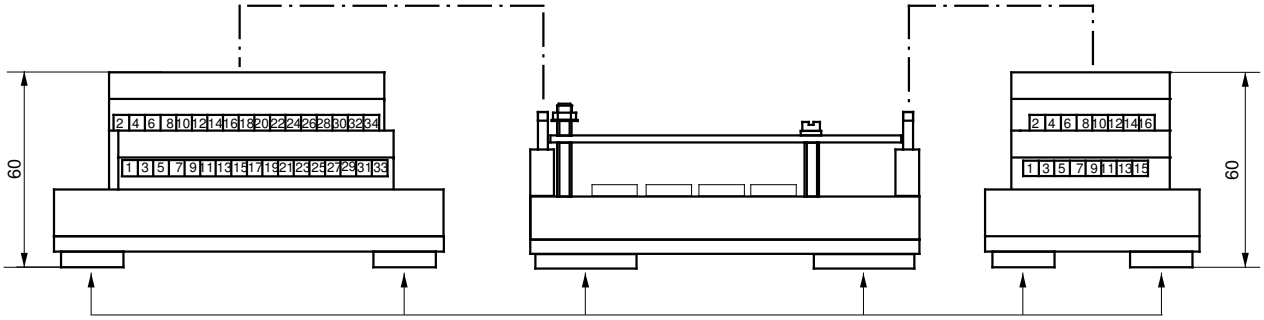
Thermocouple Amplifier AHD 903 V

All plug-in connections of the ribbon cables are equipped with strain relief acc. DIN 41651

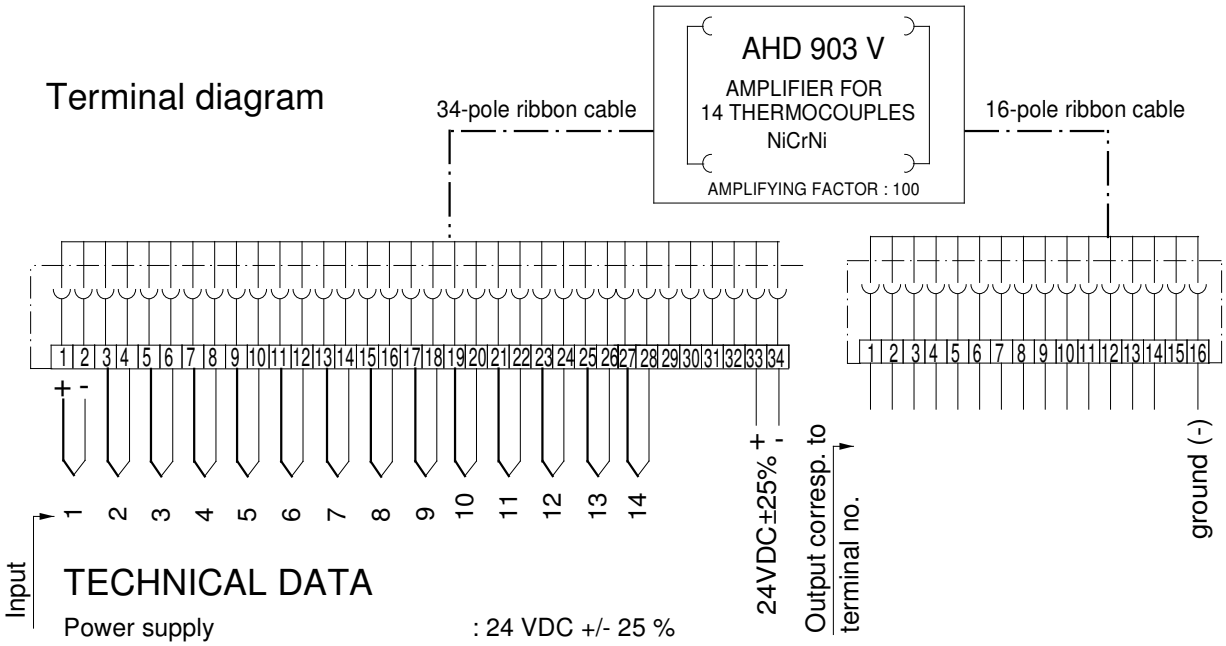
DIMENSIONAL DRAWING



Mountable on rails TS 32 and TS 35



Terminal diagram



TECHNICAL DATA

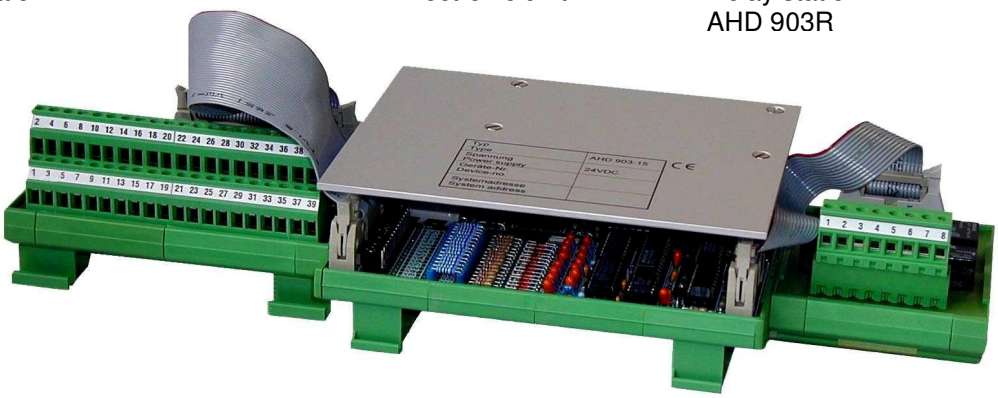
Power supply	: 24 VDC +/- 25 %
Power cons. of the electronics	: app. 0.2 A
Inputs	: 14 x thermocoupler NiCrNi
Outputs	: 14 x 0 to 2.52V equivalent to app. 0 to 600°C, not compensated
Amplification	: 101
Weight	: 0.5 kg
Protection class	: IP 00
Perm. ambient temperature	: 0 to 70°C
Max. relative air humidity	: 99%

5.2 Analogue data station AHD 903-15

AHD 903-5 is an electronic, microprocessor controlled system. It registers and processes up to 15 analogue signals. The device is designed for rail mounting and is usually installed in a control box or console. It is approved by GL for installation in diesel engine terminal boxes. AHD 903-15 consists of an electronic unit and a 40-pole substation for connection of in- and outputs. The relay station AHD 903R is connected additionally for output of exhaust gas alarms or sensor failures. Ribbon cables are used to connect up the individual devices.

Up to ten of these units (150 signals) can be connected to an LCD monitor via a 2-wire bus system and be displayed as graphic or as text. Besides a general software, there are a couple of special solutions which come with their own integrated software packages. Among these special solutions is the exhaust gas average value control. Currently, a text-oriented version is used for display on the LCD monitor.

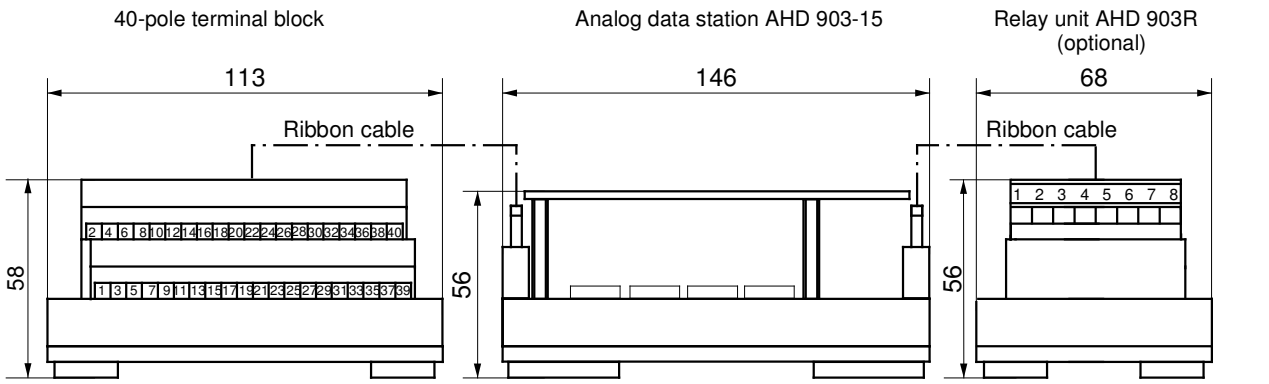
Substation Electronic unit Relay station AHD 903R



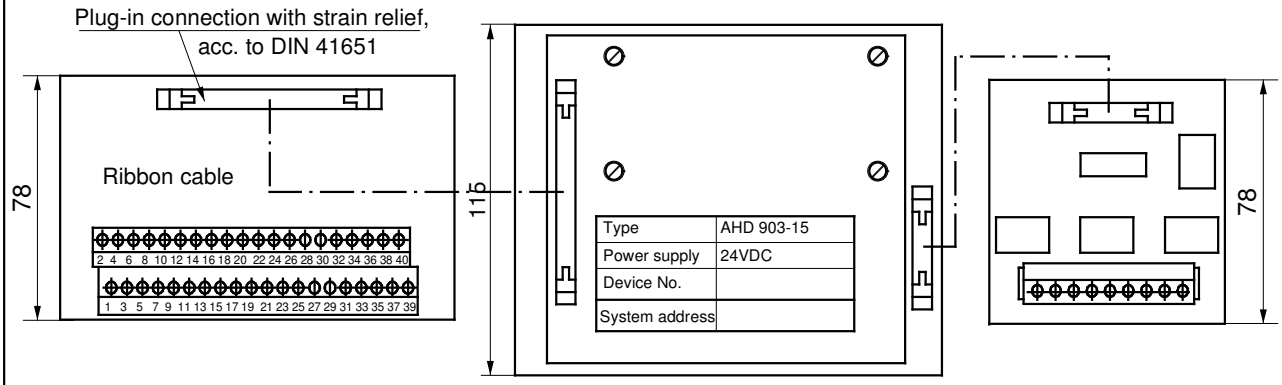
An extensive documentation can be obtained on request.

DIMENSIONAL DRAWING

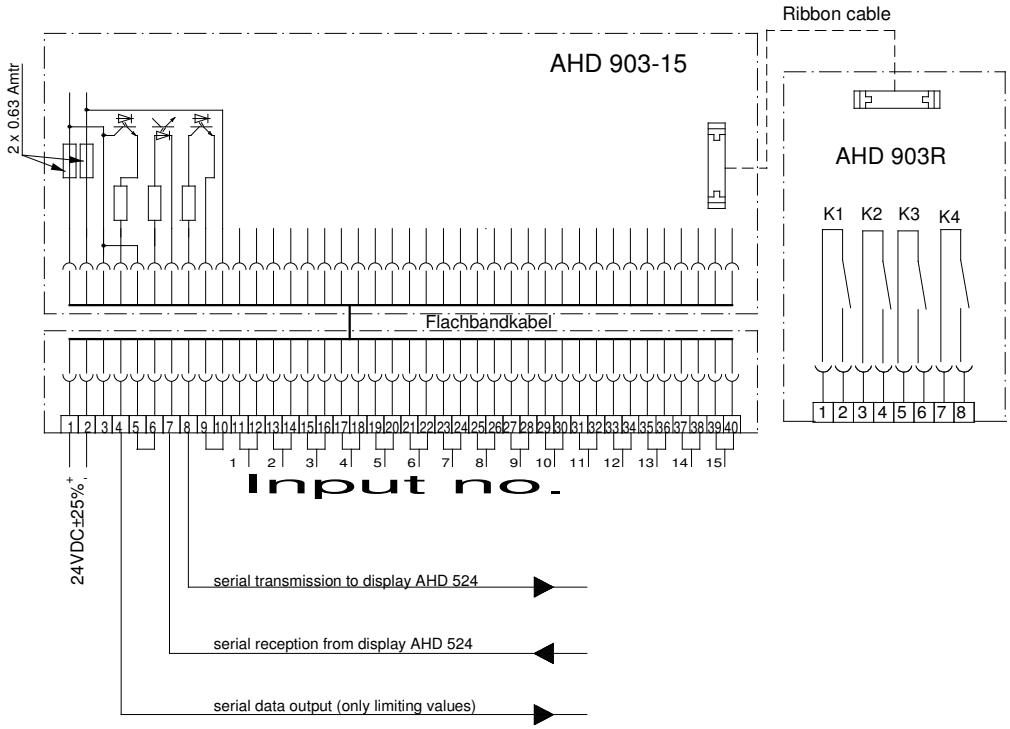
903-1-b.mcd



mountable on rail TS 32 and TS 35



TERMINAL DIAGRAM



TECHNICAL DATA AHD 903-15

Power supply	: 24VDC ± 25%
Power consumpt. of electronics	: app. 0.15 A
Number of inputs	: 15
Type of input	: Pt100, Pt1000, 0(4)-20mA, 0(1)-10V
Input resolution	: 12 bits
Permissible rel. air humidity	: 99%
Protection class	: IP 00
Weight	: 0.5 Kg

TECHNICAL DATA AHD 903R

Number of relays	: 4
Permissible load of relays	: 1 A
Permissible voltage of relays	: 50VDC C
Permissible rel. air humidity	: 99%
Protection class	: IP 00
Weight	: 01 Kg

5.3 LCD monitor AHD 524

5.3.1 General features

AHD 524 is a microprocessor controlled device which in this case is used to display and program the exhaust gas average value control.

It is possible to connect an arbitrary number of further displays (bridge, chambers, mess, ...) by means of a one wire connection plus power supply. The operation of the individual devices is independent of each other.

5.3.2 Construction of device

The LCD-monitor is a device for dashboard installation with the front dimensions 192mm x 144mm and an installation depth of 75mm. It essentially consists of two electronic cards. The display is attached to one card fastened to the front panel and the other is fastened to the inside of the rear panel. Both cards are interconnected.

The panel front is made of black anodized aluminium. A front cover is supplied to increase the degree of protection (IP 54). It is operated by buttons installed in the front panel next to the photo-electric cell for automatic dimming of the LCD. The display illumination is adapted to the ambient brightness by means of additional electronic circuitry.

A 26-pole terminal block for electrical wiring is mounted on rail TS32 or TS35. It is connected to the display unit via a ribbon cable. Where the RS232C-interface is used, an additional 20-pole terminal block is required.

5.3.3 Function

The versatile display unit software sequentially queries all AHD 903-15 data stations connected to the communication bus which is carried out by using different addresses. The measured values are checked (check sum test) and displayed as bar charts or as numerical values in tabular form. Simultaneously, additional measuring point information such as measuring point text, limiting values and the unit of the measured value is shown.

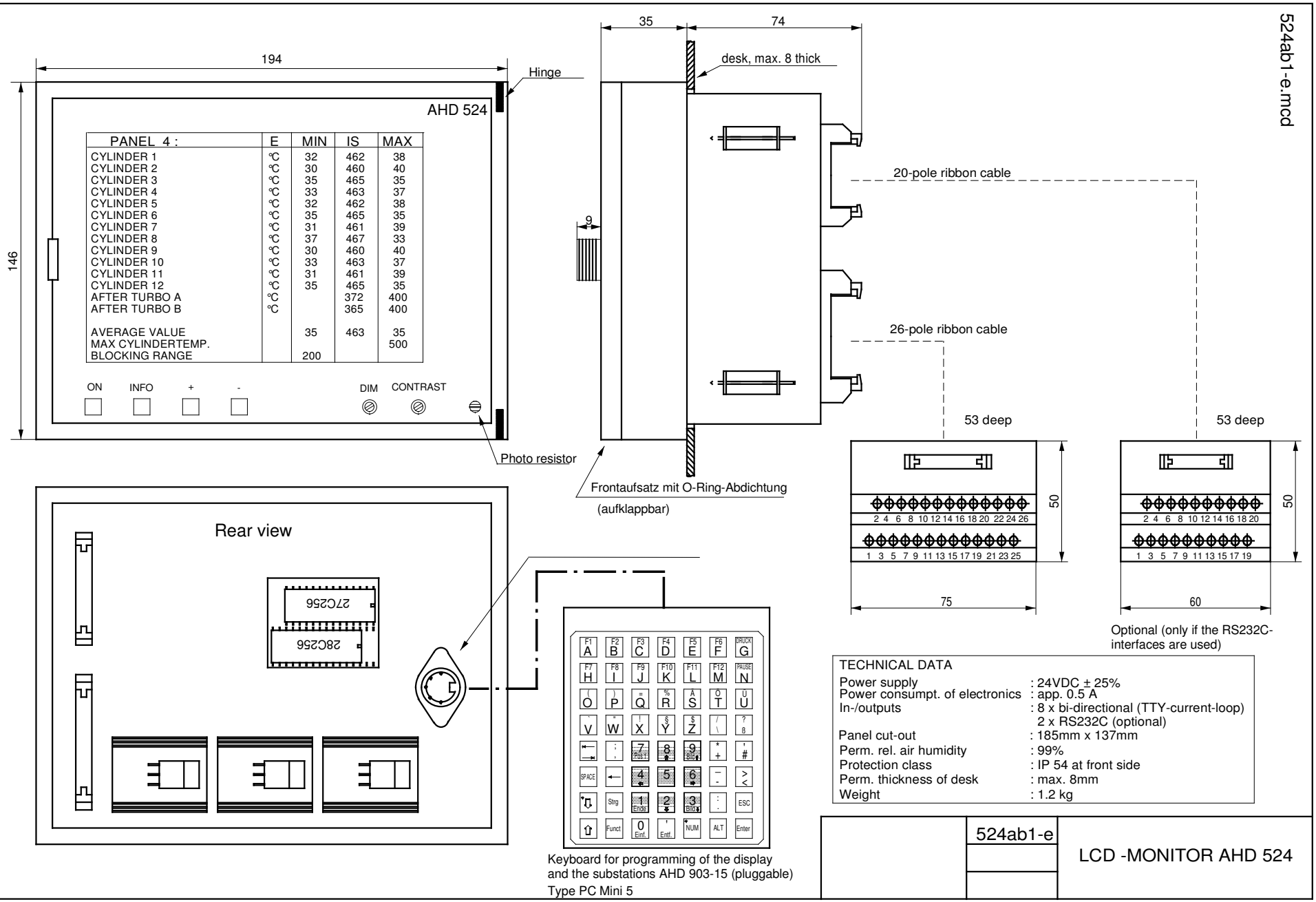
The data received from AHD 903-15 data stations is distributed to one or more displays depending on the number of measuring points. Buttons on the front panel enable the user to browse through the pages. A maximum of 18 measuring values can be displayed on one page using the tabular mode, while the graphical mode can display a maximum of 8 measuring values including additional information. Tabular and graphic displays can be combined arbitrarily in one system.

The system has an additional memory component accessible from the rear, which permanently stores all configuration data such as AHD 903-15 limiting values, input modes, range limits etc. The actual LCD display window measures 116x88 mm and has a resolution of 320x240 pixels. The height of the characters is > 3mm. Modern STN - technology combined with the aforementioned automatically dimmed background illumination enables high contrast and a good readability.

5.3.4 Interfaces

Apart from the bidirectional BUS-interface (current loop) for communication with AHD 903-15 data stations, there is an RS232-interface for connection of a serial printer as well as a vacant optional RS232-interface for data coupling with a PC.

There are 7 additional serial inputs and outputs using the same hardware as the interface for communication with the data stations.


524ab1-e.mcd
194
146
Hinge
AHD 524
PANEL 4 :
E
MIN
IS
MAX
CYLINDER 1 °C 32 462 38
CYLINDER 2 °C 30 460 40
CYLINDER 3 °C 35 465 35
CYLINDER 4 °C 33 463 37
CYLINDER 5 °C 32 462 38
CYLINDER 6 °C 35 465 35
CYLINDER 7 °C 31 461 39
CYLINDER 8 °C 37 467 33
CYLINDER 9 °C 30 460 40
CYLINDER 10 °C 33 463 37
CYLINDER 11 °C 31 461 39
CYLINDER 12 °C 35 465 35
AFTER TURBO A °C 372 400
AFTER TURBO B °C 365 400
AVERAGE VALUE 35 463 35
MAX CYLINDERTEMP. 500
BLOCKING RANGE 200
ON
INFO
+
-
DIM
CONTRAST
Photo resistor
35
74
desk, max. 8 thick
9
20-pole ribbon cable
26-pole ribbon cable
Frontaufsatz mit O-Ring-Abdichtung
(aufklappbar)
53 deep
53 deep
50
50
2 4 6 8 10 12 14 16 18 20 22 24 26
1 3 5 7 9 11 13 15 17 19 21 23 25
2 4 6 8 10 12 14 16 18 20
1 3 5 7 9 11 13 15 17 19
75
60
Optional (only if the RS232C-interfaces are used)
Rear view
27C256
28C256
Keyboard for programming of the display
and the substations AHD 903-15 (pluggable)
Type PC Mini 5
TECHNICAL DATA
Power supply : 24VDC ± 25%
Power consumpt. of electronics : app. 0.5 A
In-/outputs : 8 x bi-directional (TTY-current-loop)
2 x RS232C (optional)
Panel cut-out : 185mm x 137mm
Perm. rel. air humidity : 99%
Protection class : IP 54 at front side
Perm. thickness of desk : max. 8mm
Weight : 1.2 kg
524ab1-e
LCD -MONITOR AHD 524

6. Commissioning of the exhaust gas average value control

6.1 General features

The system is programmed ex-works according to the measuring point list attached to this documentation. A keyboard type PC Mini 5 is necessary to execute changes and/or to adjust the average value on completion of commissioning.

Please check carefully to ensure that the system is wired correctly. Are the jumpers at the analogue data station AHD 903-15 (terminal 5 and 6, or 9 and 10) attached correctly? Is the sensor for ambient temperature compensation connected and fixed at the right position where the thermocoupler amplifier is installed? If multiple-core cables are used, any free wires have to be earthed at both ends.

6.2 System start

The system is switched on by connecting the supply terminals of all devices with 24VDC +/-25%. When engine is cold, all actual values have to correspond to the temperature to which the sensor for ambient temperature compensation is exposed.

6.3 Programming by means of external keyboard type PC Mini 5

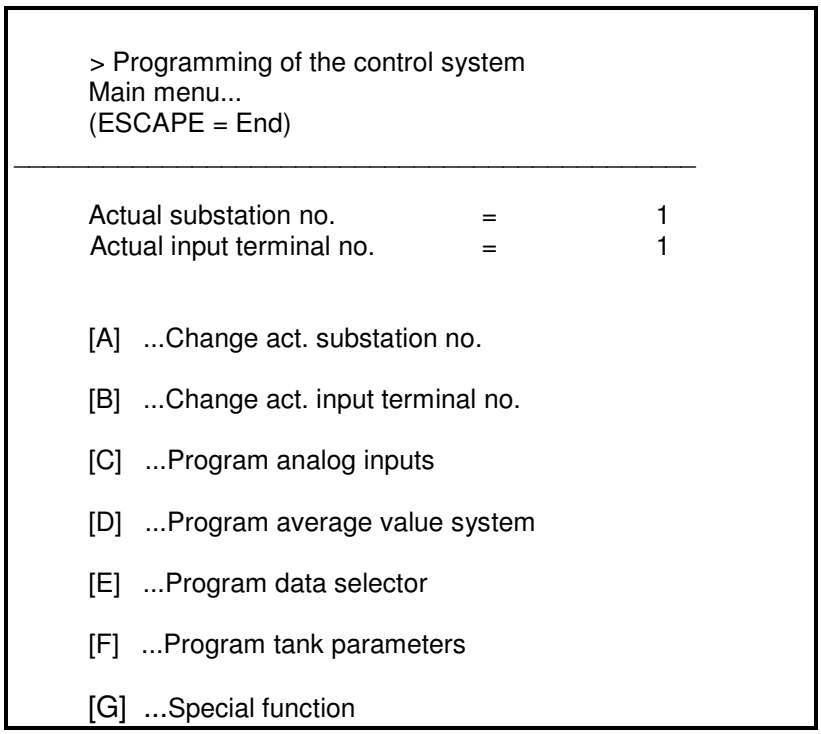
The externally connectable keyboard offers the possibility to extensively configure the system and thus to address and program all substations connected to the LCD monitor. More than one substation may be needed when the exhaust gas average value control is part of a larger alarm system, or where several diesel engines have one exhaust gas control each, or for engines with more than 12 cylinders.

First, the keyboard is connected by spiral cable to the corresponding 5-pole DIN socket, which is at the rear side of the monitor. By pressing ‘ENTER’ (below right), the main menu **‘Programming of the Control System’** is accessed. After the configuration, the main menu can be quit by pressing the ‘ESC’ button.

In case of any wrong entry or uncertainty, the main menu or the normal display mode can be accessed step by step (without any data changes) by pushing ‘ESC’ (below right just above the ‘ENTER’-button). If no entry is carried out within 3 minutes after a prompting message, the previously described ‘ESC’-function is executed internally. Thus, the system is always set back automatically into normal display mode after a certain interval.

Keyboard type PC Mini 5

After calling up the main menu by pressing the ‘ENTER’ button, the following display appears:



Subsequently, only those menu options are described that are necessary for using the system as exhaust gas average value system. The options not mentioned here are, as far as necessary, configured ex-works.

- **Function [A]** : Changing (adjusting) the current substation no. :

  With this function, the number or address of the connected substation (analogue data station AHD 903) is selected. All substations are configured ex-works, numbered (starting with address ‘1’) and pre-configured. The assignment of the substations to the single sensors (engines) has to be accurate. If there is only one substation, it has the address 1. This is usually the case for an exhaust gas average value system that is not part of an alarm system.

  Enter the desired substation number and press ‘ENTER’. This function can be quit with key ‘ESC’.

- **Function [D]** : Programming average value system

  A new submenu appears: **‘Programming of the exhaust gas average value control’**. Three functions are available which refer to the actually set substation number:

  [A] => program limiting values
  [B] => calculate average value basis
  [C] => delete average value basis

- Subfunction [A] : Program limiting values

By means of this function, all limiting value parameters that are relevant for the exhaust gas average value control can be changed. A data field appears in which all limiting values can be set and edited. In each case, the flashing limiting value can be changed by overwriting it. The new data are not saved immediately after being entered, but only after completing the whole programming block. Pressing 'ESC' twice leads to immediate termination without changes.

The following functions are available for editing:

- Numeric value plus 'ENTER' overwrites previous value.
- By pressing 'ENTER' without entering a numeric value the next parameter will be marked and no change of the actual value will be executed.
- 'Backspace' (key to the left of 4) deletes the last entered character or cancels entry and jumps to previous parameter.
- 'ESC' (once) skips all the parameters that would still have to be entered and calls up the close-off line.

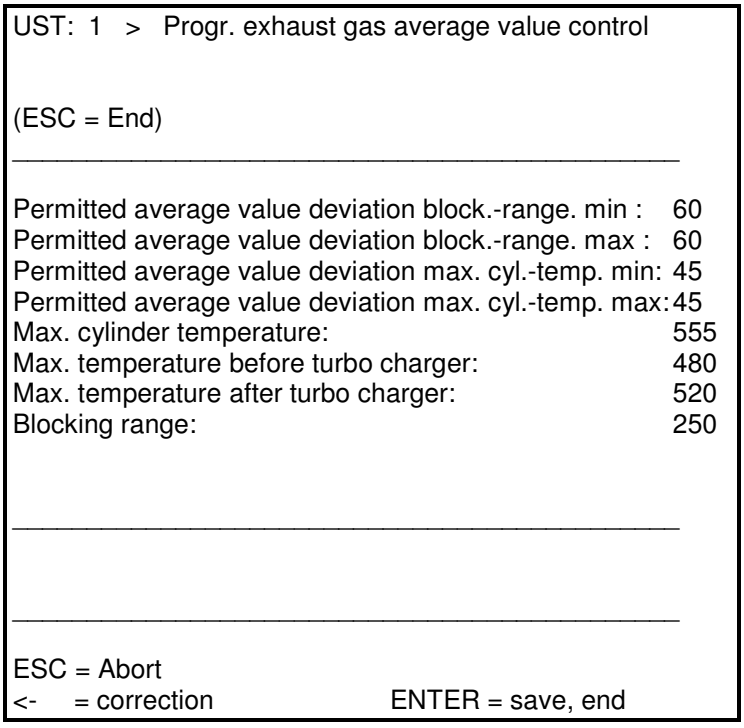
After entering or skipping all parameters, the close-off line with three possible functions appears:

- 'Backspace' enables the user to return through the parameters and enter respective corrections
- 'ESC' aborts the function and leaves everything unchanged.
- 'ENTER' confirms entry, saves data internally and transmits parameters to the currently selected substation.

After saving the data by pressing 'ENTER', the user returns to the preceding menu (programming of the exhaust gas average value control). The same happens in case of termination with 'ESC'.

In case no connection with the substation can be established, a corresponding warning message appears in the bottom line. In this case, the connection or substation number has to be checked and the procedure has to be repeated.

N.B.: In case of such a failure the new values will not have been transmitted to the substation even though they have been saved on the display.



Subfunction [B] : Execute average value adjustment

This function enables the user to perform a cylinder temperature average value adjustment, by means of which all cylinder temperatures can be equalised mathematically by offset-addition. On the upper left the actual substation no. is displayed whose correctness should be checked. As a safety measure, the adjustment command has to be reconfirmed with key ‘X’, as this is a critical function that overwrites the values of a previous adjustment.

This function can be quit with ‘ESC’ or any other key.

Subfunction [C] : Delete adjustment data

This function cancels a cylinder temperature average value adjustment that has been executed with menu option ‘B’. The offset-addition is reset to ‘zero’. The reset command now has to be reconfirmed with key ‘X’.

This function can be quit with ‘ESC’ or any other key.

MEASURING POINT LIST FOR EXH. GAS AVERAGE VALUE SYSTEM

This data sheet must be filled out be the customer. It is the basis for the factory-made design. Mistakes or missing information will lead to delays during installation and commissioning.

Length of the 26-pole ribbon cable for the LCD-Monitor AHD 524 ? .....m (2m, if not specified otherwise)

Amount of cylinders?	
Sensor before turbo charger?	
Sensor after turbo charger?	
End of blocking range (beginning of supervision)	°C
Max. cylinder temperature	°C
Max. average value deviation from end of blocking range into "plus-direction" (see A in pict. 1)	°C
Max. average value deviation from end of blocking range into "minus-direction" (see B in pict. 1)	°C
Max. average value deviation at cylinder temperature max. into "plus-direction (see Y in pict. 1)	°C
Max. average value deviation at cylinder temperature max. into "minus-direction" (see X in pict. 1)	°C

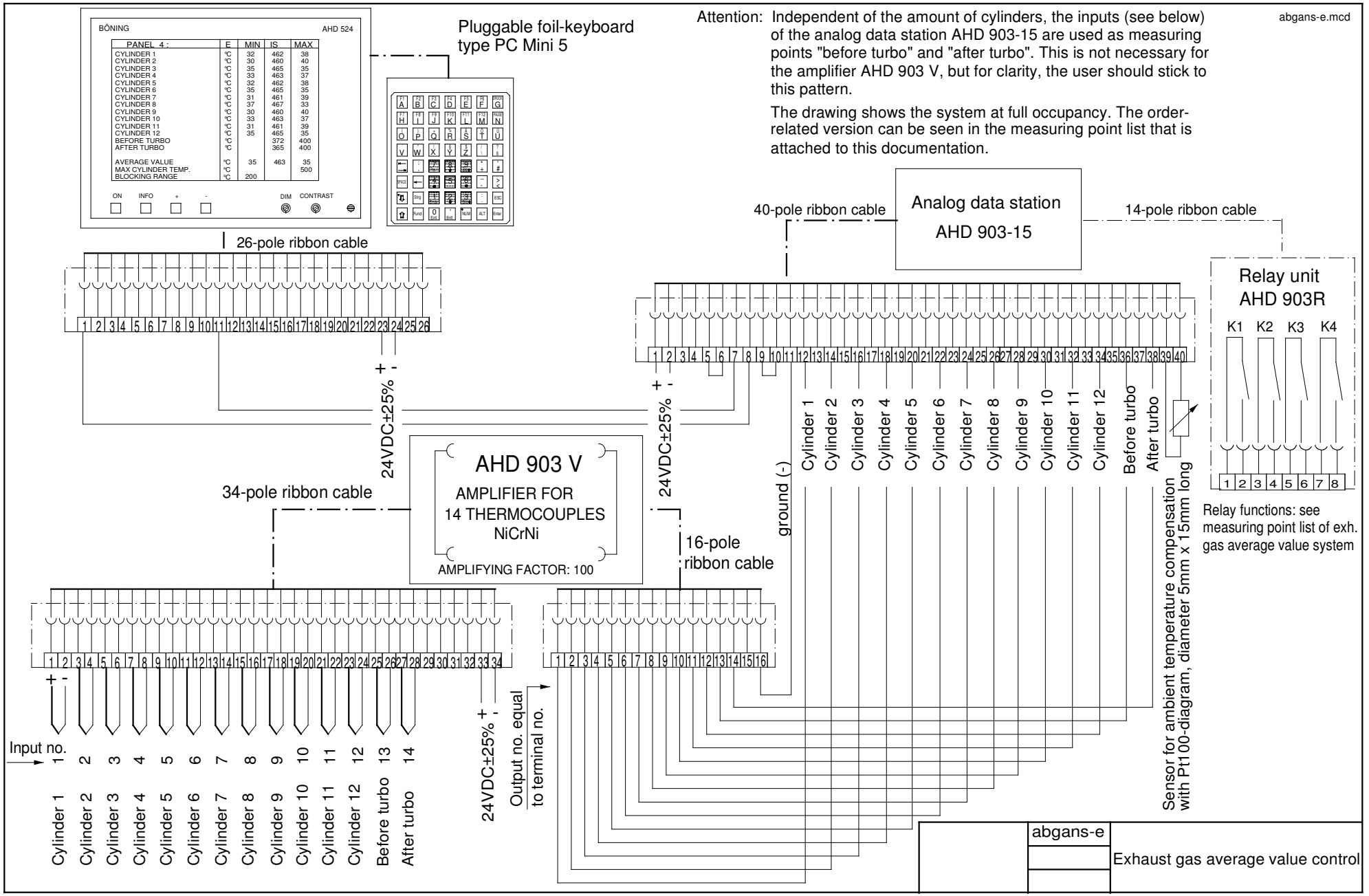
Relay Function	Relays (1 relay k1 to k4 possible per function)
1. Exh. gas average value deviation	
2. Temperature before turbo max.	
3. Temperature after turbo max.	
4. Temperature of one cylinder max.	
5. Collective report from 1. to 4.	
6. Collective report sensor failure	
7. Collective report from 1. to 6.	

Relay Function	k1	k2	k3	k4	
Relay works as first value indicator					
Relay works as new value indicator					◄ only for control purposes
Relay normally open					
Relay normally closed					◄ only for control purposes

Every relay k1 to k4 can be defined as normally open or closed. The normal status is, when there is no alarm active that is assigned to a relay. Also, every relay can operate as first value indicator or new value indicator. First value indicator means that the relay switches in the event of an assigned alarm. In case another assigned alarm is activated, this will not change the relay's switching condition. New value indicator means that the relay switches back into its normal status for about 2s, if a second alarm occurs that is assigned to it (collective alarm repetition).

In case a relay is not assigned to any of the above functions, but still defined as normally closed, it has the function "system failure".

Customer	
Customer order no.	
Böning Com. no.	


abgans-e.mcd
BÖNING
AHD 524
PANEL 4 :
E
MIN
IS
MAX
CYLINDER 1 °C 32 462 38
CYLINDER 2 °C 30 460 40
CYLINDER 3 °C 35 465 35
CYLINDER 4 °C 33 463 37
CYLINDER 5 °C 32 462 38
CYLINDER 6 °C 35 465 35
CYLINDER 7 °C 31 461 39
CYLINDER 8 °C 37 467 33
CYLINDER 9 °C 30 460 40
CYLINDER 10 °C 33 463 37
CYLINDER 11 °C 31 461 39
CYLINDER 12 °C 35 465 35
BEFORE TURBO °C 372 400
AFTER TURBO °C 365 400
AVERAGE VALUE °C 35 463 35
MAX CYLINDER TEMP. °C 500
BLOCKING RANGE °C 200
ON
INFO
+
-
DIM
CONTRAST
Pluggable foil-keyboard
type PC Mini 5
Attention: Independent of the amount of cylinders, the inputs (see below) of the analog data station AHD 903-15 are used as measuring points "before turbo" and "after turbo". This is not necessary for the amplifier AHD 903 V, but for clarity, the user should stick to this pattern.
The drawing shows the system at full occupancy. The order-related version can be seen in the measuring point list that is attached to this documentation.
40-pole ribbon cable
Analog data station
AHD 903-15
14-pole ribbon cable
Relay unit
AHD 903R
K1 K2 K3 K4
Relay functions: see measuring point list of exh. gas average value system
26-pole ribbon cable
24VDC±25%
AHD 903 V
AMPLIFIER FOR
14 THERMOCOUPLES
NiCrNi
AMPLIFYING FACTOR: 100
34-pole ribbon cable
16-pole
ribbon cable
ground (-)
Cylinder 1
Cylinder 2
Cylinder 3
Cylinder 4
Cylinder 5
Cylinder 6
Cylinder 7
Cylinder 8
Cylinder 9
Cylinder 10
Cylinder 11
Cylinder 12
Before turbo
After turbo
Sensor for ambient temperature compensation with Pt100-diagram, diameter 5mm x 15mm long
Input no.
Output no. equal to terminal no.
abgans-e
Exhaust gas average value control